ENRICHED TEACHING OF MATHEMATICS IN THE HIGH SCHOOL

A SOURCE BOOK FOR TEACHERS OF MATHEMATICS
LISTING CHIEFLY FREE AND LOW COST
ILLUSTRATIVE AND SUPPLEMENTARY MATERIALS

WOODRING—SANFORD

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ENRICHED TEACHING OF MATHEMATICS IN THE HIGH SCHOOL

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Enriched Teaching of Mathematics In the High School

A SOURCE BOOK FOR TEACHERS OF MATHEMATICS
LISTING CHIEFLY FREE AND LOW COST
ILLUSTRATIVE AND SUPPLEMENTARY MATERIALS

By

MAXIE NAVE WOODRING

ASSOCIATE PROFESSOR OF EDUCATION
TEACHERS COLLEGE, COLUMBIA UNIVERSITY

AND

VERA SANFORD

TEACHER OF MATHEMATICS, LINCOLN SCHOOL
TEACHERS COLLEGE, COLUMBIA UNIVERSITY

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PREFACE

The growing desire to connect school subjects with real situations and to provide for the independent investigation of problems by individual students has resulted in a frequently expressed need of a source book listing materials that have been actually tried out for these purposes in high school classes and that may be obtained at low cost. This need is nowhere more apparent than in mathematics, where knowledge of the applications of the subject in business, economics, and industry must necessarily be obtained by observation and vicarious experience rather than by first-hand contact. Accordingly, this booklet has been compiled with a view to providing teachers with lists of illustrative materials drawn from many fields, with suggestions for club work and other extra-curricular activities, and with bibliographies dealing with the historical and cultural aspects of the subject. These lists, in themselves, suggest many class applications.

The materials of this booklet have either been examined and tested by the compilers, or else they have been recommended as practical by experienced teachers. The prices given have been carefully checked, but as they are subject to change, it is well to ascertain the cost before placing any order. In many cases, substantial discounts are allowed on school orders. The statement that materials are intended for use in teaching should accompany requests for the literature distributed by banks, bond houses, insurance companies, and the like, for while these companies are glad to coöperate in educational programs and while many of them have pamphlets prepared especially for this purpose, they are anxious to differentiate between requests from prospective patrons and those from school classes.

Blank pages are provided at the end of each section for listing additional sources. It is suggested that these pages be utilized for noting local firms whose material is of interest and also for items which appear subsequent to the publication of this bulletin, or for items omitted from its pages.

It would have been an endless and almost impossible task to collect the amount and kind of materials listed herein without the assistance and coöperation of mathematics teachers who have been members of Education Courses 35A, 36A, 235F,

236F, s235G, s236F, Em236—(High School Methods) at Teachers College, Columbia University. The compilers acknowledge their extreme indebtedness to those students, and to the firms and publishers who submitted materials for examination.

The authors will be very grateful for suggestions on material to be used in later editions of this pamphlet.

MAXIE NAVE WOODRING
VERA SANFORD

Teachers College
Columbia University
April, 1928

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I. MATERIALS FOR THE STUDY OF SPECIAL TOPICS

A. ARITHMETIC

BANKING AND INVESTMENTS

The best single source of material for a class studying banking and investments is a copy of the Sunday issue of the *New York Times* or a similar issue of some other newspaper. This should be consulted for the Stock Page, the Bond Page, Clearing House Transactions, Rates of Foreign Exchange, advertisements of bond issues and of stocks, notes on the state of the market, the report of the Federal Reserve Bank, and its discount rate. Other sections of the paper give illustrations of the use of fractions and per cents in many other connections. Copies of the current issue of *The Times* cost 10c when ordered by mail.

Banking

American Bankers Association. 110 East 42nd St., New York City.

This association has materials on savings banks, thrift, and similar topics, prepared as part of their educational program. See THRIFT, p. 9.

Banking Through the Ages. Noble Foster Hoggson. Union Library Association, 118 East 25th St., New York City. $1.50.

A beautifully illustrated account of the history of banking from ancient times to the present. It describes the banking customs of the Greeks, the Romans, the Jews, and the merchants of the Middle Ages. It also tells of the founding of the Bank of England and the beginnings of the great modern banking houses.

How to Use Your Bank. McCall's Service Booklets (October 1927). McCall's Magazine, 236 West 37th St., New York City. 10c.

A practical leaflet of four pages on savings accounts, checking accounts, choosing your bank, using your bank, and what your bank has the right to ask of you.

Money and Banking. John Thom Holdsworth. Appleton and Co., 29 West 32nd St., New York City. $3.00.

A treatment of the history and practices of banking, including a discussion of the Federal Reserve System.

Talks on Banking and Elementary Economics for Grammar Schools. Public Education Commission, American Bankers Association, 110 East 42nd St., New York City. Free.

These talks are prepared for bankers to use in addressing schools in Thrift Week and on similar occasions. The topics are: What Is a Bank? How People Make Use of Money. The Rewards of Saving Money.

Talks on Banking and Elementary Economics for High Schools. Public Education Commission, American Bankers Association, 110 East 42nd St., New York City. Free.

Eight talks addressed to seniors in high school, but useful for junior high school pupils as well. The topics are: What is Wealth? The Nature of a Bank. Protecting Your Savings. How Banks Help Business. The Federal Reserve System. How Banks Help Foreign Trade. The Banker and the Farmer. Banking as a Vocation and Profession.

The Protection of Checks. A booklet distributed by George LaMonte and Son, 61 Broadway, New York City. Free.

This booklet tells how checks may be protected against alteration and also gives practical rules to be followed in writing and using checks.

See MOTION PICTURES (p. 64):

"Department of Treasury"
"Federal Reserve System"
"Frenzied Finance"
"Making a Mint of Money"
"Modern Banking"
"Money, Old and New"
"Money Talks. Mortgage"
"Romance of a Republic"

See also THRIFT, INSURANCE, AND SAVINGS (p. 9).

Money

The Geography of Money. William Atherton du Puy. National Geographic Magazine, LII: 744-768 (December 1927). Address: The National Geographic Society, Hubbard Memorial Hall, Washington, D. C. 50c.

This article, with its many illustrations, is an interesting supplement to any work on the types of money now in use in this country.

The Money of the United States. Harriet E. Ventress. Washington Bureau, 1322 New York Ave., Washington, D. C. 5c.

This bulletin summarizes the evolution of money. It gives the different mint marks, tells how money gets into circulation, and discusses the various types of legal tender.

Rare American Coins and Their Values. Ruth T. Robertson. Washington Bureau, 1322 New York Ave., Washington, D. C. 5c.

A list of the coins of the United States with the collectors' value of each.

Sending Money to People at a Distance

American Express Money Orders

Information concerning American Express Money Orders can be obtained from a local drug store. The American Express Company office also distributes a descriptive circular telling about them.

Money Orders

Application blanks for Domestic Money Orders can be obtained from any post office. They give the rates at which money orders are issued and the territory within which they may be used.

Foreign Money Orders

Application blanks for Foreign Money Orders can also be obtained from post offices. These are interesting in contrast to the domestic forms.

Travelers Cheques and Letters of Credit

A descriptive circular can be obtained from the American Express Company or from a local bank. It tells about travelers cheques and letters of credit, the advantages of each and the prices paid for them.

Investments

Safety of Savings. Bankers Loan and Investment Co., 24 and 36 Pine St., New York City. Free booklet.

Describes financial institutions under government supervision, the banking laws of New York State used as a model, the term "shares," description of the Bankers Loan and Investment Company, ordinary savings plan, systematic savings plan, simple mailing system, temporary receipts, guaranteed income certificates.

Financial Sections of The Outlook, Harper's Magazine, The Atlantic Monthly and other periodicals contain authoritative and interesting popular articles on different types of investments.

Bonds

Liberty Loan Triumph Seen Ten Years After. Carson C. Hathaway. New York Times, Sunday, May 8, 1927. Section xx, p. 2. Consult library files.

Describes the Liberty Loan Drives and tells about the retirement of these bonds to date.

Prudence Bonds Provide the Guarantee That Prudence Demands. Address: Advertising Manager, The Prudence Co., 331 Madison Ave., New York City. Free booklet.

The story of a bond that marks a new era in public safety. Interest charts.

Security Bonds. J. A. W. Inglehart & Co., 102 St. Paul St., Baltimore, Md. Free booklet.

Some simple principles of real estate mortgage investment, such as what becomes of the mortgage, five ways to test a bond, the question of interest. In writing for this booklet, the company asks that mention be made that it is for school use.

The Knack of Corralling Dollars. O. H. Keller. Address: Advertising Manager, The Prudence Co., 331 Madison Ave., New York City. Free booklet.

A booklet showing the working of the Prudence Partial Payment Plan, including tables. Contains a chart on how to make sure of financial independence. Shows how rapidly money grows when saved and invested regularly.

Mortgages

Guaranteed Mortgages on New York City Real Estate. Lawyers Mortgage Co., 56 Nassau St., New York City. Free booklet.

Discusses such topics as real estate first mortgages, selection of the mortgage, care of the mortgage, guaranteed mortgages, the guarantee premium, security insurance, taxes and assessments, interest, form of policy, etc.

How to Buy Your Home. Glyndon Priestman. Address: Ladies' Home Journal, Independence Square, Philadelphia, Pa. 15c.

This booklet tells about mortgages, building a house, financing the building and searching the title. It is written in a direct and popular style and furnishes a background for problems connected with real estate and the building of houses.

Safety Limits. Lawyers Mortgage Co., 56 Nassau St., New York City. Free booklet.

A brief history of mortgages and certificates from the time the real estate is first selected to the time it reaches maturity.

Leaflets Describing Bonds. Real Estate Mortgage and Guaranty Corporation, 26 Jackson Place, Washington, D. C. Free.

Typical leaflets are:

1. "The Brighton Apartment." Description, sinking fund, title, insurance, etc.
2. "Bonds on Properties of Charles King and Son Co., Inc." Guaranty, security, net worth, earnings, management, properties, valuations, title and insurance, sinking fund, legality, price.

Stocks

Comparative Statistical Charts of 49 Companies manufacturing automobiles, trucks, buses, accessories, etc. Ward, Gruver and Co., 20 Broad St., or 131 East 86th St., New York City. Free.

Gives securities outstanding, par value, present annual dividend per share, present market price, net current assets, ratio of current assets to current liabilities, net tangible assets per share, net income after depreciation, interest and taxes, surplus, quotations of common stock, high and low, inventories, production or sales, nature of business.

These charts deal with companies manufacturing automobiles, oil companies, steel, railway and electrical equipment companies, mining companies. Most of the charts are issued yearly.

Trading Methods. Chisholm & Chapman, 52 Broadway, New York City. Free booklet.

This pamphlet gives a brief explanation of stock market dealings: buying stocks outright and "on margin," selling stock, "selling short," the transfer of stock, brokers' statements, and the like.

Weekly Financial Report. Tobey and Kirk, 25 Broad St., New York City. Free.

Discusses mail order stocks, the bond market.

Weekly Market Letter. McClave and Co., 67 Exchange Pl., New York City. Free.

A report on the condition of the markets. Evaluation of different companies.

Stock Exchange

The Committee on Publicity of the New York Stock Exchange has a booklet for distribution which gives the history, organization, operation and service of the Stock Exchange. Address: The New York Stock Exchange, New York City. Free.

For other materials write: Cameron Beck, Education Personnel Man, New York Stock Exchange.

The booklet noted above contains a helpful picture of the Stock Exchange with a key which permits the ready visualization of the Exchange and its methods of working.

Under the Spreading Buttonwood Tree. Visugraphic Pictures, Inc., 247 Park Ave., New York City. Free.

A one-reel (fifteen minute) motion picture story of the New York Stock Exchange. A historical sketch, produced under the auspices of the Library Committee of the New York Stock Exchange.

"Under a spreading buttonwood tree, at a time when little old New York was still very little, a few gentlemen laid the foundation of America's greatest institution, for the buttonwood tree of 1792 is the New York Stock Exchange of today. Against this picturesque background are interesting and unusual 'shots' which show the growth of this big market place, and the association of 1,100 brokers. Actual scenes from the floor of the Exchange are shown. We see stocks and bonds bought and sold, orders received, transactions recorded, the money desk where borrowers and lenders meet, securities delivered, and the clearing house where final reports of the day's transactions are taken."

A lecture will be sent with the film if desired.

See also MOTION PICTURES: "A Trip to Wall Street," p. 65.

Bankruptcy

The Making of a Stock Broker. Edwin Lefevre. Saturday Evening Post, July 19, 1924. Consult library files.

This article gives an instance in which two firms went bankrupt simultaneously. In computing the amount due each from the other, it developed that the firm with the smaller debt had to make the larger payment. This suggests interesting problems in algebra.

Clearing House

Constitution—Managers' Annual Report. May be obtained from New York Clearing House, 77 Cedar St., New York City. Free.

The activities of the Clearing House include the clearing of coupons clipped from bonds as well as the clearing of checks. The methods used in transferring millions of dollars in checks between the member banks in an incredibly short time are of especial interest.

Our Daily Drama of a Billion Dollars. Silas Bent. New York Times Magazine, Sunday, January 25, 1925. Consult library files.

A description of the activities of the New York Clearing House.

Reports—Financial Section of the Sunday New York Times. 10c.

This section gives the amount passing through the Clearing House during the current week and compares it with the amounts cleared previously.

Federal Reserve Bank

A B C of the Federal Reserve System. Edwin Walter Kemmerer. Princeton University Press, Princeton, N. J. $1.50.

A clear and comprehensive account of the Federal Reserve System.

Federal Reserve Bank of New York. Federal Reserve Station Post Office, New York City. Free.

The "Monthly Review" gives a statement of the business conditions in the United States.

See MOTION PICTURES: "The Federal Reserve System," p. 64.
Also BANKING—"Talks on Banking and Elementary Economics for High Schools," p. 2.

BANKING AND INVESTMENTS. (Add other materials in the space below.)

THRIFT, INSURANCE, AND SAVINGS

This topic includes the applications of mathematics that are important in the life of every thrifty citizen. Although this subject matter is usually given in the junior high school or in the upper grades, it is frequently ignored in the senior high school where the applications of the compound interest law can be studied by means of logarithms.

Thrift

How to Pension Yourself. Albert W. Atwood. Saturday Evening Post, April 16, 1927. Consult library files.

Describes ways that may be used to build up a fund whose income will act as a pension.

Poster Series on Character Development: Thrift. 11 subjects, $5.50. National Child Welfare Association, Inc., 70 Fifth Ave., New York City.

These posters will add interest to discussions on thrift and savings as related to character.

The Science of Fortune Building. George M. Forman and Co., 112 Adams St., Chicago, Ill., and 120 Broadway, New York City. Free booklet.

The amazing way money grows; compound interest chart; how your fortune grows from a small foundation; graphic representation by drawings; the difference between spending and investing.

Teaching Thrift Through the School Savings Bank. Clifford B. Upton. Third Yearbook of the National Council of Teachers of Mathematics (1928). Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.

This article discusses the value of school savings banks in teaching habits of thrift, showing how the school bank puts the "laws of learning" into practice.

The Secret of Thrift. Clifford B. Upton. Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City. 15c.

This is a manual for seventh grade teachers, containing a letter on the subject of thrift addressed to seventh grade pupils. The

compound interest law is represented as an Aladdin's lamp, making everything it touches grow. Several tables are included and the article is full of suggestions for work with the compound interest formula in courses in algebra.

Thrift—the Highway to Success. Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City. Free.

A booklet that discusses the motives of thrift, the teaching of thrift, and the investment of money that is saved.

National Thrift News. National Thrift Committee, 347 Madison Ave., New York City. Free.

This is a leaflet issued monthly by the National Thrift Committee of the Young Men's Christian Association, telling of the progress and work of their thrift campaign.

A Project in Thrift Education. Presented by the Thomas A. Edison Junior High School, Los Angeles, Calif. Address: Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City. Free.

A play built around school savings, presented before the annual meeting of the Savings Bank Division held in 1926. The pamphlet tells of the cooperation of the different school departments in writing, costuming, and producing this play.

See also SAVINGS BANKS, p. 14.

Budgets

Budgeting and Household Accounts. Franklin M. Kerby. Washington Bureau, 1322 New York Ave., Washington. D. C. 5c.

This bulletin tells how to plan a budget and how to classify expenditures. It also gives condensed budget plans for various incomes and for families of different sizes.

The Family Budget. Isabel Ely Lord. McCall's Service Booklets (1924). McCall's Magazine, 236 West 37th St., New York City. 10c.

Gives practical directions for making a budget.

The Household Budget. Leaflet. Address: Sam T. Greene, Newark, N. J., or The Trust Company of New Jersey, Union City, N. J. Free.

Sample form of budget with sufficient number of blanks to keep the family budget for one year. Suggestions for budget making and residence inventory.

Income and Outgo. Mary Anne Kirkpatrick. Woman's Home Companion Service Department, 250 Park Ave., New York City. 25c.

This bulletin gives reasons for making a budget and tells how to plan it.

The Little House That Budget Built. John Wanamaker, Furniture Department, 8th Ave. and Broadway, New York City. Free booklet.

An interesting account of the furnishing of a home on a small income.

Little Talks on Family Finance. Crowell Publishing Co., 250 Park Ave., New York City. 5c each.

These are popular articles, good for Thrift Week programs, but they do not contain material that lends itself well to problem making. The topics are as follows:

"How to Make a Family Survey."
"Systematic Spending for the Family."
"Making the Budget Work."
"How to Establish Family Credit."
"Financial Knowledge Every Family Should Have."
"Investing the Family Savings."

The New Success and Happiness Family Budget. National Thrift Committee, 347 Madison Ave., New York City. 50c.

This book tells how to make and keep a budget. It includes budget forms and gives suggestions for budgets to be kept by children of various ages.

Bostwick's Budget. National Thrift Committee, 347 Madison Ave., New York City. 50c.

This is an account of the way in which budgeting helped a young couple out of serious financial difficulties.

My Budget, 1927. Leaflet. Bankers Loan and Investment Co., 34 Pine St., New York City. Free.

An interesting account of systematic saving and thrift: how to proportion your income; how to use a budget; a tentative budget for the year. The leaflet also includes a complete form for a budget of one year by months.

Suggested Budgets for an Average Home. Mildred Weigley Wood. McCall's Service Booklets (October 1927), McCall's Magazine, 236 West 37th St., New York City. 10c.

A single sheet showing ways of budgeting an income of $2,500 for families of two to five persons. A source for interesting problem work.

Budget and Expense Account Blank. Service Department, Union Dime Savings Bank, 701 Sixth Ave., New York City.

The Service Department of this bank will supply Budget and Expense Account Blanks for a month's expenditures and will also send suggested budgets for families and for professional women.

See MOTION PICTURES: "Mrs. Brown versus the High Cost of Living," p. 66.

Buying on the Installment Plan

Studies in the Teaching of Arithmetic. Clifford B. Upton. Bureau of Publications, Teachers College, Columbia University, New York City. 25c.

A chapter in this bulletin tells how the rate of interest may be computed when articles are bought on the installment plan, and shows how high these rates frequently are.

Should We Stop Installment Buying? (1) Installment Buying and Its Cost. James Couzens. (2) The Case for Installment Buying. Charles Connard Hatch. The Forum, LXXVII, No. 5 (May 1926). The Forum Publishing Co., 441 Lexington Ave., New York City. 40c.

This article gives the economic arguments for and against "easy payment" plans.

Insurance

Am I Getting the Most Out of My Life Insurance? A descriptive pamphlet issued by the Equitable Life Assurance Society, 393 Seventh Ave., New York City. Free.

A very interesting discussion of the value of different types of life insurance.

Handbook of Life Insurance and Annuity Policies for Teachers. Teachers Insurance and Annuity Association of America, 522 Fifth Ave., New York City. Free.

This bulletin gives illustrations of benefits obtained from "Deferred Annuities."

Insurance Is Adapted to Our Complex Life. New York Times, Sunday, March 20, 1927. Consult library files.

This article gives reasons for large policies as protection to business firms and as a help in settling large estates. It also discusses *term* insurance.

Selecting a Life Insurance Policy. R. W. Burgess. Western Electric Co., 195 Broadway, New York City. Free pamphlet.

A particularly valuable pamphlet, written by a trained mathematician.

Ten Unusual Stories from Real Life. United States Mortgage and Trust Co., 55 Cedar St., New York City. Free.

This pamphlet describes the use of different types of life insurance in meeting different "real life" situations.

Equitable Life Assurance Society, 120 Broadway, New York City.

This company will furnish free pamphlets descriptive of the many types of insurance which they handle:

"What Life Insurance Is and What It Does" contains the American Experience Table of Mortality.

"Sail All Set" shows the use of insurance policies to provide for a child's education.

"Every Month of Every Year" discusses life income insurance.

"Equitable Life Annuities" is a descriptive pamphlet with an interesting table based on case studies of the holders of annuities.

New York Life Insurance Company, 346 Broadway, New York City.

Write this company for information regarding insurance. Sample forms for Ordinary Life Insurance, 20 Payment Life and 20 Year Endowment policies are of especial interest.

Northwestern Mutual Life Insurance Company, Milwaukee, Wis.

This company publishes a leaflet, "Life Lines," descriptive of the types of policies which it issues. It has other descriptive material which it will furnish on request, such as: Proposal Form Documents; Small Annual Statement; Facts and Figures; Bird's-Eye Statement; History, Plans, and Methods.

The last of these gives the history of life insurance and a description of various types of insurance.

Provident Mutual Life Insurance Company of Philadelphia. P. O. Box 1463, Philadelphia, Pa.

This company will furnish booklets on life insurance as an investment. It will also send tables of premium rates and a folder entitled: "What Is the Best Form of Policy?"

Specimen Policies may be obtained from insurance companies. Consult your local insurance agents.

The Travelers Insurance Company, Hartford, Conn.

This company issues a mimeographed circular of questions and answers on such topics as Group Insurance, Automobile Insurance, Accident Insurance, Life Insurance, Workmen's Compensation Insurance.

See also MOTION PICTURES: "Insurance," p. 66.

Postal Savings

Inquire at your local post office for information regarding postal savings.

Savings Banks

Buried Treasure Pursues Owners. New York Times, Sunday, March 6, 1927. Consult library files.

How owners of savings bank deposits are located.

Interest Tables. Perley Morss and Co., 165 Broadway, New York City. $1.06.

Interest tables on a 365-day and a 360-day basis. Practical and useful.

School Savings Banking. American Bankers Association. Ronald Press, 15 East 26th St., New York City. $1.25.

A collection of articles giving the views of bankers and educators on the teaching of thrift in schools, together with much additional information on thrift.

Service Department of the Union Dime Savings Bank, 701 Sixth Ave., New York City.

This bank will send on request a booklet giving the history of the Union Dime Savings Bank, tables showing the way regular deposits grow, forms for depositing money and for withdrawing it, and budget plans.

School Savings. W. Espey Albig. Address: Gurden Edwards, Director of Publicity, American Bankers Association, 110 East 42nd St., New York City. Free.

An address given before the Savings Bank Division of the American Bankers Association, setting forth the objectives and progress of school savings banks.

School Savings Banking: Annual Report. Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City. 25c.

This bulletin gives recent figures on the progress of school savings banks and an honor roll of schools in which a high percentage of the students are depositors in the school bank.

A Project for Thrift Education. Presented by the Thomas A. Edison Junior High School, Los Angeles, Calif. Address: Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City.

A description of the writing and producing of a play built about the idea of school savings.

Local Savings Banks. Consult for rates, dates of compounding interest, minimum size of initial account, etc. Savings banks frequently have useful literature which shows how rapidly money accumulates if one saves systematically. Inquire also about Christmas Funds.

Building and Loan Associations

A Home "Free and Clear." Equitable Life Assurance Co., 120 Broadway, New York City.

A bulletin that describes a combination of insurance and a home purchase plan.

How to Establish Family Credit. Porter Elizabeth Ritchey. Crowell Publishing Co., 250 Park Ave., New York City. 5c.

A leaflet that includes a short history of Building and Loan Associations.

Pennsylvania Railroad Employes Provident and Loan Association. Pennsylvania Railroad, Philadelphia, Pa. Pamphlet P L A 42.

An explanation of the method of making loans for the building of a house or for its purchase. Gives rates of payments and also includes tables showing progress of a loan of $1,000 toward extinction if payments of $10 or $12.50 are made each month.

Rating Building and Loan Associations by States. William Stephen Marlowe. Magazine of Wall Street, October 9, 1926, p. 1128. Consult library files.

A descriptive article dwelling especially on regulations imposed by the various states on the operation and government of Building and Loan Associations.

United States National Building and Loan Association, 1411 Walnut St., Philadelphia, Pa.

This company will furnish advertising material showing the operation of this association. The bulletins are plainly written and easy to grasp, and furnish telling examples of the operation of the compound interest law.

Building and Loan Associations: also called

Savings and Loan Associations
Building and Savings Associations
Homestead Associations
Coöperative Banks.

Local associations will furnish information regarding this field for investment.

Materials from local companies will show the terms on which loans are made. These should be compared with the terms made by banks and contrasted with the terms of the Morris Plan, and other such agencies.

Industrial Savings Plans

Annual Report of the American Telephone and Telegraph Co., 195 Broadway, New York City. Free.

In this report is outlined the company's "Thrift Program for Employees."

Industrial Relations. Eastman Kodak Co., Rochester, N. Y. Free.

An explanation of a profit-sharing plan and the Eastman Savings and Loan Association.

Pennsylvania Railroad Employes Provident and Loan Association. Pennsylvania Railroad, Philadelphia, Pa. Pamphlet P L A 46. Free.

This pamphlet gives a table showing the amount of pension paid based on monthly contributions of $5 or $10 for from ten to fifty years. It also gives a table showing the amount of these monthly payments in one to fifty years.

Regulations of the Pennsylvania Railroad Employes Provident and Loan Association. Pennsylvania Railroad, Philadelphia, Pa. Pamphlet P L A 1. Free.

A description of the system in use by the Pennsylvania Railroad. It might well be the subject of a special report.

The Why and How of Thrift. W. A. Schnedler. Western Electric Co., 195 Broadway, New York City. Free.

An excellent and practical pamphlet, illustrating the work done by corporations in promoting habits of thrift among their employees.

Taxes

Income Tax Payable under New 1926 Act Compared with Rates under Past Laws. New York Times, February 25, 1926. Consult library files.

This includes a table showing the amount paid in different years on the same income. Current February and March newspapers should be watched for similar material.

New York Budget Makers at Work. New York Times, August 15, 1926. Consult library files.

Tells how the money needed by the various departments of the city government is apportioned.

Federal and State Income Tax blanks provide current regulations and problem material. It would be well to have both the blanks for the lowest class of income that is taxable and also the blanks for the higher classes. The Federal Income Tax blanks may be obtained from any bank between January and March.

THRIFT, INSURANCE, AND SAVINGS. (Add other materials in the space below.)

ENGLISH AND METRIC WEIGHTS AND MEASURES

The Encyclopaedia Britannica has an authoritative article on Weights and Measures and much information may be gained from other encyclopedias. The history of the effort to maintain standard units is one which should interest the students of the secondary schools, while the work of the Bureau of Standards and the question of the metric system versus the English system are of importance to all American citizens. Additional information of interest is to be found in the histories of mathematics (see p. 97).

English Measures

Gage Blocks and Accessories. C. E. Johansson, Inc., Detroit, Mich.

A catalogue which shows one method of checking weights to tell their degree of precision.

Household Weights and Measures. Circular No. 39, Bureau of Standards. Superintendent of Documents, Washington, D. C. 5c.

This is a card giving the most commonly used tables, approximate weights of certain common commodities, common rules of measurement, and a height-weight table for boys and girls. This card can be made the source of problems connected with household measurements.

History of the Standard Weights and Measures of the United States. Louis A. Fisher. Circular No. 64, Miscellaneous Publications, Bureau of Standards. Superintendent of Documents, Washington, D. C. 15c.

This bulletin outlines the steps in the adoption of our present standards of weights and measures in the United States. A brief account is given of the history of the English standards, and illustrations show both the present standards and their older prototypes.

Measurements for the Household. Circular No. 55, Bureau of Standards. Superintendent of Documents, Washington, D. C. 45c.

A discussion of weighing and measuring as done in an up-to-date kitchen and the measuring of heat, light, gas, electricity, time, etc. Illustrations show fraudulent measures.

The National Bureau of Standards, Its Functions and Activities. Circular No. 1. Superintendent of Documents, Washington, D. C. 50c.

This bulletin describes the varied activities of the Bureau. Among other facts, it gives the early history of standard weights and measures in this country and describes similar bureaus in other lands. It gives illustrations of standard weights and measures furnished to the states, and of the standard kilogram.

Metric System

The American Institute of Weights and Measures. 115 Broadway, New York City.

This organization publishes a magazine called "Weight and Measure," which contains material relating to the question of the English versus the metric system. Certain issues of the magazine have extensive bibliographies and they should be consulted for material for debates regarding the advisability of discarding our present units.

A Bill to Fix the Metric System of Weights and Measures as a Single Standard. School Science and Mathematics, Vol. XXI, pp. 251-253 (March 1921). Single copy 35c.

This gives a bill which was introduced into the House of Representatives on December 29, 1920.

Federal and State Laws Relating to Weights and Measures. Miscellaneous Publications No. 20, Bureau of Standards. Superintendent of Documents, Washington, D. C. Free.

The title of this booklet gives sufficient explanation of its contents.

International Metric System (Chart). Miscellaneous Publications No. 3, Bureau of Standards. Superintendent of Documents, Washington, D. C. 25c.

This is a large chart showing the various measures of the metric system and comparing them with the measures in common use. Invaluable for the bulletin board of a class studying the metric system.

Metric Association, 156 Fifth Ave., New York City.

For twenty-five cents the Metric Association will send a school or an individual a collection of material which includes a metric play, articles on the value of the metric system, a Metric Manual for Soldiers, and copies of the quarterly magazine, "Measurement."

Weights and Measures. Miscellaneous Publications No. 74, Bureau of Standards. Superintendent of Documents, Washington, D. C. 60c.

The report of the nineteenth national conference of delegates from various states who met to discuss the subject of weights and measures in May, 1926.

See also MOTION PICTURES and PLAYS, pp. 66 and 76.

WEIGHTS AND MEASURES. (Add other materials in the space below.)

TIME AND THE CALENDAR

The discussions relative to the possible adoption of a new calendar of thirteen months of twenty-eight days each are provocative of many questions which pertain to the formation of the calendar. This leads naturally into the subject of the determination of time and time zones. It is suggested that class work with time zones be illustrated by the use of time tables showing the changes at particular railroad junctions. How people have measured the passage of time by hourglasses, water-glasses, sundials and the like proves an exceedingly interesting topic for mathematics clubs.

The Fixed Calendar at Work. Dixon Merritt. Outlook, 147: 178-180 (October 12, 1927), 120 East 16th St., New York City. 15c.

Describes the way the Fuller Brush Company divides the calendar into thirteen periods for business purposes.

Railroad Time Tables, listing trains that go from one time zone into another, provide illustrations of changing time. So, too, do posters advertising special trains that cross the time lines. The Canadian National Railway Time Tables, for example, give trains that cross several of these lines.

Shall We Scrap Our Calendar? F. H. A. The Outlook, 147: 109-112 (September 28, 1927), 120 East 16th St., New York City. 15c.

Describes the disadvantages to business of the present calendar and shows how they would be obviated by the proposed "International Fixed Calendar."

Sundials. George T. Odell. The Washington Bureau, 1322 New York Ave., Washington, D. C. 5c.

This bulletin gives a short account of the history of the sundial, together with directions for making a sundial and setting it up.

Time Throughout the World. Circular C 280, Bureau of Standards. Superintendent of Documents, Washington, D. C. 5c.

A historical sketch of the development of the standard time system. A map showing zone boundaries and a table of standard time in foreign countries are also included.

See MOTION PICTURES for films on "Time" and "Astronomy," pp. 61 and 67. PICTURES on "Clocks," p. 122.

TIME AND THE CALENDAR. (Add other materials in the space below.)

APPROXIMATE COMPUTATION

The following articles are of interest in view of the increasing consideration being given to computation with rounded numbers. Since all measurements of weights, time, and distances are only approximations to the truth, it is exceedingly important to make certain that the results of computations are not reported with an unwarranted appearance of accuracy.

The Accuracy of the Values for π. Sidney Walck. The Mathematics Teacher, XIX: 110-111 (February 1926). Single copy 40c.

A summary of the history of the evaluation of π and a comment on the size of the error arising from using π, as computed by Shanks to 707 decimal places.

Errors in Computation and the Rounded Number. Harris Rice. The Mathematics Teacher, XV: 392-404 (October 1922). Single copy 40c.

In this article, Professor Rice not only gives the meaning of rounded numbers, but also shows how to find the error of the result of computation.

Measurement and Computation. George W. Finley. Third Yearbook of the National Council of Teachers of Mathematics (1928). Address: Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.

This chapter of the Yearbook discusses the subject of measurement and computation in a simple and interesting way.

The Teaching of Direct Measurement in the Junior High School. William Betz. Third Yearbook of the National Council of Teachers of Mathematics (1928). Address: Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.

In this discussion, Mr. Betz gives the cultural background of measurement by showing its importance and telling its history in brief form. He outlines classroom procedure, treats the subject of accuracy, gives theoretical considerations, and closes with a bibliography which includes the theory of measurement. A highly interesting and valuable article.

APPROXIMATE COMPUTATION. (Add other materials in the space below.)

B. ALGEBRA

Illustrative materials for algebra may be found in the formulas that appear in connection with many types of scientific work. Advertising material should be studied for the use of negative numbers, graphs, and formulas. See, for example, the references under the heading, "Use of Graphs," on p. 28.

Graphs

The growing importance of the use of graphs and their wide applications in science and in the social studies make the teaching of graphs an essential part of school work in mathematics; while their frequent appearance in magazine articles and newspapers makes the ability to read and interpret graphs essential to every citizen. A graph blackboard is therefore a very necessary piece of equipment. It may be painted on a flexible piece of blackboard cloth, to be rolled up when not in use. (Such equipment can be purchased from J. L. Hammett Company, 380 Jelliff Ave., Newark, N. J.) It is more satisfactory, however, to have the graph blackboard a part of the permanent equipment of the room. This can be done by painting the needed lines on the regular blackboard, using light gray or light green paint and making the squares ½-inch to 1-inch on a side.

Construction of Graphs

Eugene Dietzgen Co., 218 East 23rd St., New York City.

Keuffel and Esser Co., 127 Fulton St., New York City.

All types of graph paper can be obtained from these two firms.

Dennison Manufacturing Company, Fifth Ave. and 26th St., New York City.

This company makes lantern slide binding, at 15c a roll, which can be used in making bar graphs. It is a thin, black, paper tape, ½-inch wide, gummed on one side. Suitable lengths of the tape are glued onto graph paper. The resulting diagram has many advantages over those made by inking in the bars; the color is even, the work is rapidly done, and the finished graph is very effective.

This company also sells red, green, and gold gummed paper ribbon ½-inch wide at 10c a roll. This is good for bar diagrams when several groups of items are to be represented.

Reproducing Original Charts and Graphs. Louis Amber and Co., 9 East 38th St., New York City.

This firm makes photostat reproductions of charts, graphs, and posters at 25c each. A very fine way to get copies of interesting and unusual work of pupils.

The Graphic Method of Representing Facts. W. C. Brinton. Engineering Magazine Co., 381 Fourth Ave., New York City. $4.00.

This is the standard work on the subject.

Examples of Graphs

For illustrations of graphs see current numbers of the National Education Association Journal, the Literary Digest, Sunday papers, and the advertisements in the various magazines.

Abstract of the Census, 1920. Superintendent of Documents, Washington, D. C. $1.50.

Abstract of the census for 1920, giving a large amount of statistical material. A good source of data for graphs.

Annual Report of the American Telephone and Telegraph Company, 195 Broadway, New York City. Free.

This report includes some excellent graphs.

Diagram of Contents of Bottle of Milk—in Per Cents. Sheffield Farms Co., 524 West 57th St., New York City. Free.

Picture graphs of food elements in eggs, fowl, potato, beef, codfish, cabbage, spinach—calorie value given.

Meter Facts. New York Edison Co., Irving Pl. and 15th St., New York City. Free.

Many well made graphs are shown in this bulletin.

The Outline of Business. Chatham Phenix National Bank and Trust Co., 149 Broadway, New York City. Published monthly. Free.

Well made graphs of different types, dealing with current business situations, are published in this bulletin.

Parcel Post Rate Card

A poster giving parcel post rates can be obtained from most local post offices. This furnishes excellent material for work in graphs.

Statistical Bulletins issued by the Metropolitan Life Insurance Co. 1 Madison Ave., New York City. Free.

These bulletins are full of graphs and tables dealing with vital statistics. They are issued monthly. This company will also furnish a series of graphs showing "Mortality from All Causes of Death." These are scientifically made and are large enough for use on bulletin boards.

Use of Graphs

Crickets as Thermometers. Literary Digest, Vol. 95, No. 2, p. 25 (October 8, 1927). 10c.

A study showing the relation between the temperature and the number of chirps a cricket makes per minute. A graph is given and the rule is stated in words. A straight line formula may easily be derived.

Forecasting the Growth of Nations. Raymond Pearl and Fred C. Kelly. Harper's Magazine, May, 1921, pp. 704-713. 35c.

An excellent article in which graphs are used in predicting population statistics.

GRAPHS. (Add other materials in the space below.)

The Slide Rule

The importance of the slide rule as an aid to computation in many fields makes it a valuable subject of study for classes in mathematics, for mathematics clubs, or for groups of individuals. The necessary equipment consists of a slide rule for each person and a demonstration slide rule, if the group is large. Manuals are furnished with the more expensive rules and the cheaper ones have an explanatory leaflet.

Equipment

Demonstration Slide Rules. Keuffel and Esser Co., 127 Fulton St., New York City.

This firm manufactures two demonstration slide rules:

Mannheim Slide Rule, $8.00.
Polyphase Slide Rule, $15.00.

The Mannheim Slide Rule will be adequate for ordinary purposes, as it enables one to perform all but the most complicated computations.

Individual Slide Rules. Keuffel and Esser Co., 127 Fulton St., New York City. Also Eugene Dietzgen Co., 218 East 23rd St., New York City.

Consult the catalogues of these two firms for prices. It should be noted that the pictures and descriptions given in these catalogues provide valuable material for explaining the uses of the slide rule.

Manuals

Evolution of a Slide Rule. Keuffel and Esser Co., 127 Fulton St., New York City. Free.

A mimeographed set of directions for making and operating a slide rule, the object being to learn the methods of using a slide rule by actually constructing a rule and experimenting with it. The directions are clear and concise.

Self-teaching manuals by William E. Breckenridge. Keuffel and Esser Co., 127 Fulton St., New York City. 50c each.

The titles of these manuals are: The Mannheim Slide Rule; Polyphase Slide Rule; Polyphase Duplex Slide Rule; Log Log Slide Rule.

The Use of the Slide Rule. A. R. Cullimore. Keuffel and Esser Co., 127 Fulton St., New York City. $1.00.

A practical manual of slide rule instruction.

The Slide Rule. Keuffel and Esser Co., 127 Fulton St., New York City.

A four-page bulletin containing items of interest to slide rule clubs and classes; issued at frequent intervals and sent free of charge to teachers who ask that their names be put on the mailing list.

Supplementary Material

A Convenient Rule for Locating the Decimal Point in Slide Rule Calculations. Lloyd C. Elliott. School Science and Mathematics, XXVI: 957-959 (December 1926). Single copy 35c.

This article gives directions for high school classes in physics which will help in placing the decimal point in computation. The directions are simple and practical.

High School Mathematics Clubs. Zulu Reed. The Mathematics Teacher, XVIII: 344-363 (October 1925). Single copy 40c.

In this article is reprinted a story by W. E. Breckenridge which appeared in "The Mathematics Teacher," XVI: 332-334 (October 1923). The article also gives directions for making a slide rule.

On the History of Gunter's Scale and the Slide Rule during the 17th Century. Florian Cajori. University of California Publications on Mathematics, Vol. 1, p. 1920.

The most complete history of the slide rule, but unfortunately out of print. Consult library for copy.

The Slide Rule as a Subject of Regular Class Instruction in Mathematics. W. E. Breckenridge. The Mathematics Teacher, XIV: 342-343 (October 1921). Single copy 40c.

A statement of the varied uses of the slide rule in mathematics and physics.

The Slide Rule in Junior and Senior High School. J. F. Barnhill. The Mathematics Teacher, XVII: 359-364 (October 1924). Out of print. Consult library files.

This article lays particular stress on the value of the slide rule as a check on computation.

The Slide Rule in Plane Geometry. W. W. Gorsline. The Mathematics Teacher, XVII: 385-403 (November 1924). Single copy 40c.

This is a part of the report of a committee of the Chicago Men's Mathematical Club on the use of the slide rule. It shows its use in solving problems involving proportion, similar figures, areas.

A Talk on Logarithms and Slide Rules. Florian Cajori. School Science and Mathematics, XX: 527-530 (June 1920). Single copy 35c.

Tells of the Napier Tercentenary at Edinburgh in 1914 and reproduces two pages from the first work published on the slide rule.

Time Is Money. William E. Breckenridge. Mathematics Teacher, XVI: 332-334 (October 1923). Out of print. Consult library files.

A radio talk in the form of a dialogue between two high school boys who are discussing the uses of the slide rule in school and out.

SLIDE RULE. (Add other materials in the space below.)

C. GEOMETRY

Illustrative material for demonstrative geometry is limited in the main to information relating to the theorems now in the course and to works on such topics as non-Euclidean geometry and the Famous Problems of Antiquity, which are interesting to many but which do not form a part of the core of the work. Classroom equipment helpful in the teaching of geometry is described on p. 116.

Illustrative Material for Plane Geometry

Calculation by Geometry of Astronomical Distances. Joseph V. Collins. School Science and Mathematics, XX: 416-418 (May 1920). Single copy 35c.

Shows how geometry may be used to measure the size of the earth, the distance from the earth to Mars when these two planets are closest together, and the distance from the earth to the sun.

Chart of Commander Byrd's Flight to the North Pole. National Geographic Magazine, September, 1926, p. 386. Address: The National Geographic Magazine, Washington, D. C. 50c.

This chart shows the route of Byrd's plane to the Pole, giving bands of uncertainty due to uncertainty in steering and also to uncertainty in measuring the sun's altitude. It provides a real application of the locus idea.

Geometric Exercises in Paper Folding. T. Sundara Row. Open Court Publishing Co., Chicago, Ill. $1.00.

Shows how a considerable amount of plane geometry may be covered by paper folding.

Geometry Detected by Sherlock Holmes. Blanche B. Hedges. The Mathematics Teacher, XIV: 128-136 (March 1921). Single copy 40c.

A comparison between the method of discovering the proof of a theorem in geometry and the method used by Sherlock Holmes in analyzing and solving one of his typical situations.

How to Draw a Straight Line. F. E. Tuck. School Science and Mathematics, XXI: 554-558 (June 1921). Single copy 35c.

Describes the construction of linkages which may be made of wood to draw a straight line without the use of a ruler.

Jewels of Winter Storms Caught by the Camera. William A. Bentley. New York Times Magazine, Sunday, March 6, 1927. Consult library files.

Gives many photographs of snow crystals. Others may be seen in various reference books or in slides and photographs obtainable from the American Museum of Natural History. (See MOTION PICTURES, "Mysteries of Snow," p. 65; also LANTERN SLIDES, p. 70.)

A Proof of the Pythagorean Theorem. George W. Evans. The Mathematics Teacher, XVI: 440 (November 1923). Out of print. Consult library files.

This article gives a diagram and outlines a proof for the Pythagorean proposition which depends on the areas of parallelograms applied in an ingenious fashion.

Ruler and Compasses. B. H. Hudson. Longmans, Green and Co., 55 Fifth Ave., New York City. $2.20.

This book gives various geometric constructions, using the straight edge alone and using the compasses alone. It includes a summary of Lemoine's scheme, "Geometrography," for judging the accuracy of a construction in geometry.

Source Problems in Geometry. Mabel Sykes. Allyn and Bacon, 11 East 36th St., New York City. $2.50.

This book contains a large number of applications of geometry in various fields.

The Terminology of Elementary Geometry. L. C. Karpinski and Adelaide M. Fiedlander. School Science and Mathematics, XXIV: 162-167 (February 1924). Single copy 35c.

The introduction to this article explains the preponderance of Latin terms in the vocabulary of geometry. This is followed by tables which show the original form of each word, the language through which it came into English, and the first instance of its use in English, so far as this can be determined.

The Thirteen Books of Euclid's Elements. T. L. Heath. Cambridge University Press. Macmillan Co., 60 Fifth Ave., New York City. Three vols., $22.50.

This is the most valuable single work in geometry that one can have in his library. It repays constant study. A translation of

Euclid's text is given, together with historical notes on the previous history and subsequent development of each topic.

See also LANTERN SLIDES, p. 71, for illustrations of the use of geometric design in primitive ornament and for examples of symmetry in nature.

Non-Euclidean Geometry

Elements of Non-Euclidean Geometry. D. M. Y. Sommerville. Open Court Publishing Co., Chicago, Ill. $2.00.

"An excellent textbook for teachers of geometry who wish to understand the position in which Euclid's parallel postulate has been placed by modern thought. The author has shown great skill in his use of pre-existing notions, and the reader to whom the subject is new is not discouraged by an over-elaboration of axioms." (Journal of Education.)

Geometrical Researches on the Theory of Parallels. Nicholaus Lobachevski. Open Court Publishing Co., Chicago, Ill. $1.25.

Translated from the original by George Bruce Halsted. Illustrated by numerous geometrical figures. Contains a bibliography of material on non-Euclidean geometry.

Non-Euclidean Geometry. W. H. Bussey. The Mathematics Teacher, XV: 445-459 (December 1922). Single copy 40c.

This summarizes the attempts at proving the parallel line postulate, the development of non-Euclidean geometry, and its relation to the space in which we live.

Non-Euclidean Geometry. H. S. Carslaw. Longmans, Green and Co., 55 Fifth Ave., New York City. $2.25.

A treatise which includes valuable historical notes as well as a treatment of non-Euclidean geometry and trigonometry.

Fourth Dimension

Flatland: A Romance of Many Dimensions. "A. Square" E. A. Abbott). Little, Brown and Co., 354 Fourth Ave., New York City. $1.25.

An interesting speculation about existence as it would be in a world that consists of a line and in a world that consists of a plane. As such, it serves as an introduction to the idea of a fourth dimension. Three-dimensional space is strange and unthinkable to the person who lives in Flatland—why should four-dimensional space, strange as it seems, be an impossibility although *we* live in three-dimensional space?

Flatland—A Symposium. Walter Crosby Eells. School Science and Mathematics, XXVI: 67-71 (January 1926). Single copy 35c.

The reactions of a class of college freshmen to E. A. Abbott's "Flatland." These range from contempt to sincere approval. Eells has added a biographical note on Abbott.

The Fourth Dimension: An Explanation the Geometry Class Can Follow. Joseph V. Collins. School Science and Mathematics, XXII: 226-232 (March 1922). Single copy 35c.

A simple discussion dealing with the things which may occur in the several types of space, the things which cannot occur, and the relation of each to the higher types of space.

The Fourth Dimension and Hyperspace. Theresa Tromp. The Mathematics Teacher, XIX: 140-146 (March 1926). Out of print. Consult library files.

Good for a club program, as it is written in an easy and popular style.

The Fourth Dimension Simply Explained. Henry P. Manning. Munn and Co., 20 West 40th St., New York City. $1.50.

A collection of essays on the fourth dimension.

Reflections on the Fourth Dimension. A. M. Altieri. The Mathematics Teacher, XVIII: 490-495 (December 1925). Out of print. Consult library files.

A paper written by a pupil in the high school in Newton, Mass. Accordingly, it is particularly interesting to high school pupils.

Some Varieties of Space. Emilie N. Martin. The Mathematics Teacher, XVI: 470-480 (December 1923). Single copy 40c.

Discusses the three geometries—elliptic, hyperbolic, and parabolic, extending them to three-dimensional space. The treatment is within the comprehension of a junior or a senior in high school, provided he is willing to discard the Euclidean postulates with which he is familiar.

Famous Problems of Antiquity

Budget of Paradoxes. Augustus DeMorgan. Revised by David Eugene Smith. Open Court Publishing Co., Chicago, Ill. 2 vol., $5.00.

A satire on the circle squarers with notes by Professor Smith explaining contemporary allusions whose point would otherwise be lost.

A Companion to the Elementary School Mathematics. F. C. Boone. Longmans, Green and Co., 55 Fifth Ave., New York City. $4.50.

Contains notes on Euclid's postulates, the "Three famous problems," approximations to the value of π, etc.

Graphical Trisection of an Angle. E. D. Pickering. School Science and Mathematics, XXII: 548-549 (June 1923). Single copy 35c.

A method of trisecting an angle by means of a marked straight edge. The proof necessitates a knowledge of the relation between angles and intercepted arcs.

History of Mathematics. David Eugene Smith. Ginn and Co., 70 Fifth Ave., New York. Vol. II. $4.40.

Pages 297-316 of this book comprise the best single treatment of the subject.

Why It Is Impossible to Trisect an Angle or to Construct a Regular Polygon of 7 or 9 Sides by Ruler and Compasses. Leonard Eugene Dickson. The Mathematics Teacher, XIV: 217-223 (May 1921). Single copy 40c.

A discussion which necessarily includes a considerable amount of algebra but which can be followed by senior students.

GEOMETRY. (Add other materials in the space below.)

D. TRIGONOMETRY AND SURVEYING

Problems in elementary surveying are of great value in connection with intuitive geometry and numerical trigonometry in the junior high school, and, with more refined methods, they have important uses in senior high school trigonometry as well. Among the problems suited to junior high school work are mapping the school playground, finding the height of the school building, and the like. The work of one group of students may be checked by that of another. These problems may be framed to meet the Boy Scout requirements. Much of the equipment for such projects can be made in the school shop. Ideas for this work will be found in the illustrations in supply company catalogues and in articles.

Equipment

Catalogues. Consult the catalogues of

Central Scientific Co., Chicago, Ill.
Eugene Dietzgen Co., 218 East 23rd St., New York City.
Keuffel and Esser Co., 127 Fulton St., New York City.
L. S. Starrett Co., Athol, Mass.

These catalogues give illustrations of traverse tables, clinometers, hypsometers, angle mirrors, surveying rods, steel tapes, transits, and levels. In many cases liberal school discounts are allowed.

Farmers' Surveying Sets consisting of a rod and level may be obtained from mail order houses, such as Sears Roebuck Co., Chicago, Ill., for about $25.00.

Rotractor. Rotractor Sales Co., 128 West 22nd St., New York City. 50c each; discount on orders of one dozen.

This instrument consists of a quarter-inch of metal that is free to swing about the center of a square. When one sights along the edge of the square toward some object, the angle of depression or of elevation may be read from the position of the quarter circle. In this way the instrument acts as an elementary transit. Perforations in the quarter circle also make it possible to use the rotractor as a pair of compasses.

Homemade Instruments. Chapter in "The Teaching of Junior High School Mathematics" by Smith and Reeve. Ginn and Co., 70 Fifth Ave., New York City. $2.00.

This chapter (Chap. XII, pp. 359-368) describes the construction and use of simple surveying instruments.

Descriptive Material

The Boy Mechanic, Book 2. Popular Mechanics Co., Chicago, Ill. $2.00.

This book contains articles by Harold G. McGee on "Plane Table Surveying," "Camera Surveying," and "Plotting a Camera Survey." It also has an article by Bennett Blacklidge on "How to Make a Surveyor's Transit." These articles are clear, practical, and stimulating to children.

Field Work. Charles W. Finley and James S. Tippett. Bureau of Publications, Teachers College, Columbia University, New York City. 75c.

A field project in surveying with an eighth grade class is described, and an ingenious transit made of a Meccano set is illustrated.

Mathematical Geography. Willis E. Jones. American Book Co., Lexington Ave. and 25th St., New York City. $1.20.

Discusses longitude and time, the calendar, map projections, triangulation.

Plane Surveying and Exercises in Surveying. J. C. Tracy. John Wiley and Sons, 440 4th Ave., New York City. $4.00.

This book gives the theory of surveying and outlines a systematic course of exercises as a preliminary drill with the various instruments.

The Plane Table. Bulletin PT—155. W. and L. E. Gurley, Troy, N. Y. Free.

Describes the plane table, and contains many illustrations.

Plane Table Manual. 25c. **Topographic Instructions.** 35c. Address: Superintendent of Documents, Washington, D. C.

These are authoritative works, published by the United States Coast and Geodetic Survey and by the United States Geological Survey.

Surveying. Merit Badge Series. Boy Scouts of America, 200 Fifth Ave., New York City. 20c.

Perhaps the best simple manual on surveying. It describes the usual methods of measuring distances, discusses map making and the use of the plane table, slope board, and other instruments.

The Use of Measuring Instruments in Teaching Mathematics. C. N. Shuster. Third Yearbook of the National Council of

Teachers of Mathematics (1928). Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.

This article is full of practical suggestions on the use of measuring instruments in class work. The illustrations are especially helpful.

The Use of the Starrett Transit. L. S. Starrett Co., Athol, Mass. Free leaflet.

Tells how to use a transit and level in ordinary problems of farm surveying.

Historical Material

Early Science in Oxford, Part II, Mathematics. R. T. Gunther. Oxford University Press, 35 West 32nd St., New York City (1922). $3.50.

A very interesting account of early English mathematics with extensive notes on mathematical instruments. Colored frontispiece and many illustrations.

Historical Instruments for the Advancement of Science. R. T. Gunther. Oxford University Press, 35 West 32nd St., New York City. 85c.

A handbook to the Oxford collections, prepared for the Opening of the Lewis Evans Collection of May 5, 1925.

Gives an account of instruments of various types, including especially those on surveying. It has fewer illustrations than "Early Science in Oxford," but the material is interesting. The arrangement is somewhat hard to follow at first.

Measuring Instruments of Long Ago. W. E. Stark. School Science and Mathematics, X: 48-67 (January 1910). Out of print. Consult library files.

The best short discussion of the measuring instruments of the sixteenth and seventeenth centuries. Its illustrations are helpful.

The Possibilities of Instrumental Development. George E. Hale. Publication 2762. Address: Superintendent of Documents, Washington, D. C.

This summarizes the history of the development of astronomical instruments, giving interesting information with regard to the precision of astronomical measurement. Tycho Brahe, for example, in the sixteenth century could measure the distance between

two stars to within 57″, while to-day, with the interferometer, this error is reduced to 0″.001.

Roman Surveying. L. C. Karpinski. School Science and Mathematics, XXVI: 853-855 (November 1926). Single copy 35c.

This article describes the Roman surveying instrument, the *groma,* which was recently discovered at Pompeii. Contains illustrations of the original groma and also of a reconstruction of the instrument.

See also Smith, "History of Mathematics," Vol. II, pp. 344-368 (Ginn and Co.), and the excellent illustrations in Wentworth-Smith-Brown "Junior High School Mathematics," Book I (Ginn and Co.) and in Gugle, "Junior High School Mathematics," Book Two (Gregg Publishing Co.).

TRIGONOMETRY AND SURVEYING. (Add other materials in the space below.)

E. RECREATIONS AND PUZZLES

The fascination of mathematical puzzles for people of all ages is attested by the puzzle pages in the Sunday papers and in many magazines. The history of these puzzles and their many variants might well be the topic for a mathematics club program, and the standard collections of puzzles should be in every high school library. Interest in algebra may be stimulated by challenging a class to the solution of a puzzle posted on the class bulletin board or announced in the school paper.

Algebraic Magic Squares. Henry P. McLaughlin. The Mathematics Teacher, XIV: 71-77 (Feb. 1921). Single copy 40c.

After a short discussion of numerical magic squares, the author shows how the same idea may be used with algebraic polynomials in the cells of the square.

Amusements in Mathematics. H. E. Dudeney. Thomas Nelson and Sons, 381 Fourth Ave., New York City. $1.75.

Includes puzzles from arithmetic, algebra, and geometry.

Boy's Own Arithmetic. Raymond Weeks. E. P. Dutton and Co., 681 Fifth Ave., New York City (1925). $2.00.

An interesting satire on problems in arithmetic and algebra.

The Canterbury Puzzles. H. E. Dudeney. Thomas Nelson and Sons, 381 Fourth Ave., New York City. $1.50.

An excellent collection of puzzles, including some not strictly mathematical in character.

Greatest Three-Figure Number. Science and Invention, 13: 1093 (April 1926), 53 Park Place, New York City.

Shows the stupendous size of this number.

High School Mathematics Clubs. Zulu Reed. The Mathematics Teacher, XVIII: 348-363 (October 1925). Single copy 40c.

Tricks with cards and with numbers.

History and Significance of Certain Standard Problems in Algebra. Vera Sanford. Bureau of Publications, Teachers College, Columbia University, New York City. $1.50.

This book contains a large amount of source material relating

to the history of verbal problems and a number of recreations not easily accessible elsewhere.

History of Mathematics. David Eugene Smith. Vol. II, Chap. VII. Ginn and Co., 70 Fifth Ave., New York City. $4.40.

Chapter VII of this book contains an authoritative and interesting account of the history of the different groups of problems and includes a detailed study of problems from the mathematics of commerce.

Magic Circles. Vera Sanford. The Mathematics Teacher, XVI: 348-349 (October 1923). Out of print. Consult library files.

Describes the magic circles of Japanese mathematics which are, in general, less well known than the magic squares. Illustrations of three types of magic circles are given.

Mathematical Pastimes. Major P. A. Macmahon. The Macmillan Co., 60 Fifth Ave., New York City (1921). $4.00.

Interesting descriptions of patterns made by the use of like-shaped figures differently colored and like-colored figures differently shaped. The discussion draws heavily on the use of permutations and combinations. It gives a systematized method of constructing repeat designs.

Mathematical Puzzles and Problems. Harriet E. Ventress. The Washington Bureau, 1322 New York Ave., N. W., Washington, D. C. 5c.

A number of interesting puzzle problems with their solutions and notes on the value of π and the duplication of the cube.

Mathematical Recreations. Chapter XIV of "The Teaching of Junior High School Mathematics," by Smith and Reeve. Ginn and Co., 70 Fifth Ave., New York City. $2.00.

This chapter gives a large number of number recreations, problem recreations, algebraic recreations, and geometric recreations, many of which are not listed elsewhere.

Mathematical Recreations. Martha Pierce. The Mathematics Teacher, XIX: 13-24 (January 1926). Single copy 40c.

This contains some recreations that are very interesting, although the historical references are not always accurate.

Mathematical Recreations and Essays. W. W. R. Ball. The Macmillan Co., 60 Fifth Ave., New York City. $3.50.

A standard work on mathematical recreations which should appear in the high school library.

Mathematics Cross-Word Puzzle. Frederick A. Keniston. School Science and Mathematics, XXV: 302-303 (March 1925). Single copy 35c.

A puzzle which could be used in a mathematics club. A key is included.

Mathematical Wrinkles. S. I. Jones, Gunter, Texas. $2.10.

A collection of puzzles useful for mathematics clubs.

Place of the History and Recreations of Mathematics in Teaching Algebra and Geometry. Lao G. Simons. The Mathematics Teacher, XVI: 94-101 (January 1923). Single copy 40c.

Although this article, as its title implies, is chiefly concerned with the uses of the history of mathematics in teaching high school work, it also contains recreational material.

Puzzle Page in the Popular Science Monthly. Sam Loyd. Address: The Popular Science Monthly, 250 Fourth Ave., New York City. Single copy 25c.

This page appears in each issue of the magazine and frequently contains puzzles of a mathematical nature. The answers are given elsewhere in the magazine.

Recreations in Mathematics. H. E. Licks. Van Nostrand Co., 8 Warren St., New York City. $1.50.

A large number of puzzle problems dealing with arithmetic, algebra, geometry, trigonometry, analytics, calculus, astronomy.

What Day Is It? R. L. Humiston. School Science and Mathematics, XXVI: 841 (November 1926). Single copy 35c.

Gives simple rules for finding the day of the week belonging to any given day in any given year.

What Day Is It? Hilton Ira Jones. School Science and Mathematics, XXIII: 825-830 (December 1923). Single copy, 35c.

A device to tell the day of the week on which a given day of a given month will fall.

RECREATIONS AND PUZZLES. (Add other materials in the space below.)

F. EXCURSIONS

The possibilities for excursions in mathematics are wider than one might at first suppose. They include visits to a bank; to the salesroom of a corporation selling calculating machines; to a civil engineer's office to see his equipment and perhaps to watch him making an actual survey; to an insurance agent's office to see his tables; to a printing establishment to see how graphs are reproduced; to a museum to see the instruments of the past. Field trips made in other connections will often yield material of mathematical interest. Visitors to Mount Vernon, for example, should study Washington's surveying instruments now on display in his library.

Field Trips

The Excursion as a Means of Education. Thomas H. Briggs. Teachers College Record, November, 1921. Bureau of Publications, Teachers College, Columbia University, New York City. Single copy 35c.

Discussion of the educational worth of the excursion as a school activity. Description of a series of excursions conducted by the Speyer Experimental Junior High School of Teachers College. Outline of a program for a trip to the Museum of Natural History: preparation for the trip, the excursion, use made of the experience.

Field Work. Charles W. Finley and James S. Tippett. A Lincoln School Bulletin. Bureau of Publications, Teachers College, Columbia University, New York City. 75c.

Besides a general discussion of the purpose and value of field trips, this pamphlet contains detailed descriptions of various types of excursions. Among them is an account of a surveying project in eighth grade mathematics.

Museums

Many museums have material of interest to students of mathematics, although this is not always recognized even by the museum authorities. The following list is suggestive of materials which may be found in museums.

Albany, N. Y.

Geological Hall. To see the way a seismograph uses graphs in recording earthquake shocks.

Boston, Mass.

Museum of Fine Arts. Collection of compasses.

Cleveland, Ohio.

The Cleveland Museum of Art. This museum has cöoperated with the schools to a great extent. One evidence of this is in a booklet "The Use of Areas in Art" written by the students of Miss Glenna L. Wells' class in the Thomas Jefferson Junior High School, Cleveland, Ohio.

New York City

1. The American Museum of Natural History. Columbus Ave. and 77th St. Symmetry in nature, primitive ornament illustrating geometry, astronomical exhibits, a collection of astronomical instruments including several astrolabes.
2. Metropolitan Museum of Art. Fifth Ave. and Central Park East. Collections of clocks, watches, and sundials. A few surveying instruments. Egyptian weights and measures. Geometric designs on early Greek vases.
3. Museum of the Peaceful Arts. 24 West 40th St. Professor David Eugene Smith's extensive collection is to be seen here. This consists of surveying instruments, calculating devices such as the suan-pan, counters for counter reckoning, tally sticks, and other items of mathematical interest.

Washington, D. C.

1. Smithsonian Institute. Material on the Maya Indians. Illustrations of primitive ornament, etc.
2. Bureau of Printing and Engraving. The making of paper money and printing of stamps.

British Isles

1. Cambridge University, Trinity College, Cambridge, England. Statues of Newton and of Barrow.
2. Oxford University, Bodelian Library, Oxford, England. Mathematical and surveying instruments, computing devices. (A description of these is given in Gunther's "Historical Instruments for the Advancement of Science." See p. 41).
3. University of Edinburgh, Edinburgh, Scotland. Portrait of Napier.

4. British Museum, London, England. Roman abacus, sun dials, instruments of various sorts, etc. The *Ahmes papyrus* may also be seen in this museum.
5. Science Museum, London, South Kensington, England. Many interesting objects, including early slide rules.
6. National Portrait Gallery, London, England. Portraits of English mathematicians, including Newton, Wallis, Barrow, and Robert Recorde.

France

The Louvre, Paris. Frans Hals portrait of Descartes. Collection of astrolabes and other instruments.

EXCURSIONS. (Add other materials in the space below.)

II. EXTRA-CURRICULAR ACTIVITIES

A. ASSEMBLIES

Assembly programs sponsored by the mathematics department may take the form of a discussion of some topic, such as mathematics in business, the use of the slide rule, computing machines, or subjects from the history of mathematics. A motion picture may be shown, a play produced, or the time devoted to mathematical puzzles and recreations.

Stimulating ideas will be found in the booklet:

Illustrated Mathematical Talks by Pupils of the Lincoln School, New York. Lincoln School, Teachers College, New York City. 50c.

This pamphlet gives a report of a parent-teachers meeting in which various phases of the work in mathematics are presented. The topics include graphs, the slide rule, geometric designs in primitive handicrafts, etc.

Suggestions will also be found under the headings:

Club Programs, p. 54.
History of Mathematics, p. 97.
Lantern Slides, p. 70.
Motion Pictures, p. 61.
Plays, p. 75.
Recreations and Puzzles, p. 43.

ASSEMBLIES. (Add other materials in the space below.)

B. MATHEMATICS CLUBS

Mathematics clubs show wide variety in their purpose and accomplishments. The following articles are accordingly grouped to show the organization of clubs and to describe contests and games in which clubs have engaged, and then to give sources of materials for club programs. The nature of these articles is such, however, that several of those given under Organization, Contests, and Games contain subject matter that is suitable for club programs. Much of the material listed elsewhere in this bulletin can be used for club activities.

Organization

Bibliographies on School Clubs and on Debating. Compiled by E. K. Fretwell. Teachers College Record, XXVIII: 1019-1034 (June 1927). Bureau of Publications, Teachers College, Columbia University, New York. Single copy 30c.

List of questions which must be considered, and annotated bibliographies. Best selected list available.

High School Mathematics Clubs. Zulu Reed. The Mathematics Teacher, XVIII: 341-363 (October 1925). Single copy 40c.

Contains a general discussion of mathematics clubs and gives programs on such topics as the use of the slide rule, tricks and puzzle problems, songs, contests, games, and a pageant. Also gives a helpful bibliography.

Junior High School Life. Thomas-Tindal and Myers. The Macmillan Co., 60 Fifth Ave., New York City. $2.00.

Chapter XIV of this book gives a general discussion of the organization and guidance of school clubs; Chapter XV lists the intra-curricular activities of the school. Rich in suggestions on the organization and administration of the following clubs: Club of Applied Mathematics, Business Correspondence Club, Junior Financiers, Mathematical Wrinkle Club, Junior Office Practice Club, Chess Club, Mathematical Recreation Club.

A Mathematics Club. Mary Caroline Hatton. The Mathematics Teacher, XX: 39-45 (January 1927). Out of print. Consult library files.

An account of the work of a mathematics club in Leonia, N. J. Suggestions for club programs may be drawn from the work done by this organization.

Mathematics Clubs. F. C. Gegenheimer. School Science and Mathematics, XVI: 791-792 (December 1916). Single copy 35c.

Shows the use of a mathematics club in caring for bright pupils.

Mathematics Clubs. Helen Russell, Minerva Duncan, Rebecca Symmes, and Mary Derby. The Mathematics Teacher, XVII: 282-285 (May 1924) and XVII: 350-358 (October 1924). Out of print. Consult library files.

The May issue discusses the organization and purposes of mathematics clubs; the October issue gives programs and bibliography.

Non-Athletic Student Activities in Secondary Schools. Q. A. Rohrbach. Westbrook Publishing Co., Philadelphia, Pa. $2.00.

A study of non-athletic student activities in 134 schools, of which 73 were senior high schools, 27 junior high schools, and 34 private schools. Expressions about clubs from 6,721 high school pupils. Statements from schools, telling of the significant things that are being done. A valuable guide in the organization and administration of high school clubs. Discussion of mathematics clubs, such as Trigonometry Club, Greek Mathematical Recreation Club, Chess Club.

Recreational Values Achieved Through Mathematics Clubs in Secondary Schools. Marie Gugle. The Mathematics Teacher, XIX: 214-218 (April 1926). Single copy 40c.

Discusses the subject in relation to the "The Cardinal Principles of Education," a treatise on the purposes of secondary education.

Recreational Values Achieved Through Mathematics Clubs in Secondary Schools. Marie Gugle and Others. First Year Book of the National Council of Teachers of Mathematics (1926). Address: Charles M. Austin, Oak Park, Ill. $1.10.

An account of the history of mathematics clubs since 1900. Suggestive programs and bibliographies are given.

The Teaching of Junior High School Mathematics. David Eugene Smith and W. D. Reeve. Ginn and Co., 70 Fifth Ave., New York City. $2.00.

Chapter XIII of this book is devoted to a discussion of the purpose and organization of mathematics clubs and includes suggestions for programs and contests as well as an extensive annotated bibliography.

Contests

Making Mathematics Interesting. Augusta Barnes. The Mathematics Teacher, XVII: 404-410 (November 1924). Single copy 40c.

Discusses clubs and contests, emphasizing contests within a class as part of the class work. It also gives a bibliography.

A Mathematical Contest. E. T. Boughn. School Science and Mathematics, XVII: 329-330 (April 1917). Single copy 35c.

A description of a contest between the Manual Arts High School of Los Angeles and the Pasadena High School.

A Mathematical Contest. Raleigh Schorling. School Science and Mathematics, XV: 794-797 (December 1915). Single copy 35c.

A description of a contest between the Hyde Park High School and the University High School in Chicago.

A New Form of School Contest. J. T. Rorer. Educational Review, 57: 339-345 (April 1919). Single copy 35c.

A mathematics contest which took the form of a track meet.

Games

A Mathematical Contest. Helen M. Walker. The Mathematics Teacher, XX: 274-279 (May 1927). Single copy 40c.

This guessing contest consists of the identification of mathematical terms represented by objects of various sorts. Many of the topics are drawn from junior high school mathematics; some belong exclusively to the senior high school field. The contest was originally used in the Twin Cities Mathematics Club, but it would be equally successful with any group of high school students. The items in the contest are described in full and a key is given.

Mathematical Games. Alfreda Raster. The Mathematics Teacher, XVII: 422-425 (November 1924). Single copy 40c.

Describes a number of ingenious games, such as a mathematics relay and a clever version of "Old Maid." All are good for mathematics clubs.

Number Games and Number Rhymes. David Eugene Smith and Students. Teachers College Record, XIII: 385-495 (November 1912). Out of print. Consult library files.

This is one of the most complete collections of number games to be had.

Suggested Club Programs

Cultural Value of Mathematics. Helen Howarth. The Mathematics Teacher, XVI: 150-156 (March 1923). Out of print. Consult library files.

Gives certain reasons why girls should study mathematics, and includes a story personifying English, Latin, trigonometry, geometry, and history.

Euclid Dramatized. Margaret Graff. School Science and Mathematics, XXI: 381-382 (April 1921). Single copy 35c.

An interesting account of the dramatization, by the South Philadelphia High School, of some of the stories of early mathematicians.

Mathematics Club Programs. Minerva Gulden and Others. The Mathematics Teacher, XVII: 355-358 (October 1924). Out of print. Consult library files.

A bibliography dealing with the history of mathematics and with recreations.

Mathematics Club Programs. A. H. Wheeler. The Mathematics Teacher, XVI: 385-390 (November 1923). Out of print. Consult library files.

A group of topics for club programs suggested by a committee of the Association of Teachers of Mathematics of New England. It also includes a bibliography.

Studies in the Teaching of Arithmetic. Clifford B. Upton. Bureau of Publications, Teachers College, Columbia University, New York City. 25c.

In this bulletin the checks by 9's and by 11's are discussed and the algebraic explanation of each is given.

Materials for Club Programs

Astronomy

Concerning the Inter-communion of Mathematics and Astronomy. Agnes G. Rowlands. The Mathematics Teacher, XVI: 48-51 (January 1923). Single copy 40c.

An article which gives an account of the discovery of the planets Uranus and Neptune. It also discusses Bode's Law and recurrent comets. The article is suggestive rather than descriptive.

Popular Astronomy. The Washington Bureau, 1322 New York Ave., Washington, D. C. 5c.

This leaflet contains important facts about the sun, moon, stars, planets, and the earth. It is concise and readable.

Very interesting material on astronomy and mathematics is listed under the two divisions, MOTION PICTURES and LANTERN SLIDES. Very useful for mathematics club programs. See pp. 61 and 70.

CALCULATING MACHINES

Decimal Equivalent Cards. Monroe Calculating Machine Co., Inc., Orange, N. J. 30c.

These cards are designed for use with a calculating machine, but they provide the stimulus of contact with business methods in a classroom. They include conversion of metric measures into the English system, interest tables on a 365-day basis, tables giving days as decimal equivalents of a year, tables giving the number of days between any two given days, tables for board measure, etc.

The same company furnishes Educational Kits, whose prices are as follows:

Insurance Book	$ .10
Bank Book	.06
Wholesale and Retail	.10
Dividend on Saving Accounts	.24
Lumber Book	.04
Sales Class Test Problems	.20
Iron and Steel	.08
Instruction on Sales Class Test Problems	.20
25 Answer Sheets	.10
Decimal Equivalent Cards	.30

Monroe Calculating Co., Orange, N. J.

Two descriptive pamphlets are obtainable free: "How to Operate Monroe Adding Calculators" and "How to Figure Percentages with Monroe Adding Calculators."

Mathematics of the Calculating Machine. L. Leland Locke. Mathematics Teacher, XV: No. 7 (November 1922) and XVII: No. 2 (February 1924). Single copy 40c. February 1924 issue is out of print. Consult library files.

The November, 1922, issue discusses the operation of calculating machines; the February, 1924, issue discusses the operation of machines for multiplication and division.

Computing Machines. General Office Equipment Corporation, 342 Madison Ave., New York City. Address: Manager of the Publicity Division.

This company issues a series of free booklets which describe the Elliott-Fisher Accounting Machine and the Sunstrand Adding Machine. The titles are:

"Under Your Finger Tips" (Sunstrand).
"Facts" (Elliott-Fisher).
"Rapid Fire Production" (Elliott-Fisher).
"Machine Gun Principles Applied to the Making of Records."
"Elliott-Fisher Simplified Accounting Machine."

Remington Typewriter Co., 374 Broadway, New York City. Free.

The pamphlet, "The Remington Typewriter Line," contains illustrations and descriptions of the various Remington machines, including Tabulating Remingtons, Accounting Machines, and Remington Bookkeeping Machines.

Pocket Adding Machines. (1) BABY CALCULATOR—Madison Sales Co., 246 Fifth Ave., New York City, or local stationer. $2.40. (2) VE-PO-AD—Any local stationer. $2.95.

The principle of these pocket machines is similar to that of the commercial models and they may be obtained at local stationers at reasonable prices. In general, their operation is slow and they cannot be recommended as substitutes for the commercial machines.

Ralph C. Coxhead Corporation. 53rd floor, Woolworth Building, New York City.

Will furnish circulars relating to the Mercedes Calculating Machine. These circulars give a brief outline of the history of calculating machines, descriptions and pictures of the Mercedes models, and a summary of their uses.

Trip Through the National Cash Register Company (a motion picture). 2 reels. State Department of Education, Division of Visual Instruction, 233 South High St., Columbus, Ohio. Free.

This picture is available to teachers of mathematics in the state of Ohio. Free with exception of transportation to and from Columbus, Ohio.

Making National Cash Registers (a motion picture). 1 reel. National Cash Register Co., Dayton, Ohio. Free.

Views in the factory at Dayton, Ohio.

Fun with Mathematics

Alice's Adventures in Wonderland. Lewis Carroll.

Certain parts of this children's classic remind one of the fact that its author, C. L. Dodgson, was a mathematician of no small note. Among these might be cited the illustration of a theorem and its converse—"I say what I mean" and "I mean what I say."

Burlesques

History of Mathematics. The Mathematics Teacher, XIX: 268-270 (May 1926). Single copy 40c.

These pages contain a burlesque of the history of mathematics as written by certain former students of Professor David Eugene Smith.

Boarding House Geometry. The Human Element in Mathematics. In "Literary Lapses" (pp. 26-27 and pp. 237-245). Stephen Leacock. Dodd, Mead and Co., 4th Ave. and 30th St., New York City. $2.00.

The first of these essays treats of life in a boarding house in the style of a textbook in plane geometry, with definitions, postulates, and theorems. "The Human Element in Mathematics" deals with the life history of A, B, and C, based on their careers as stated in verbal problems in algebra.

Boy's Own Arithmetic. Raymond Weeks. E. P. Dutton and Co., 681 Fifth Ave., New York City. $2.00.

This book contains a group of original problems in arithmetic and it is unquestionably a most entertaining satire on the problem content of our arithmetics.

The Pursuit of Zero. Emma Rounds. The Mathematics Teacher, XVII: 365-367 (October 1924). Out of print. Consult library files.

A burlesque on problems in algebra written by a junior in high school. This should be very interesting to a class working in simultaneous linear equations.

Rhymes

The Changeable Changeless Naught. Irene G. Hagan and William L. Hunter. The Mathematics Teacher, XIX: 77, 99-103 (February 1926). Single copy 40c.

Two amusing verses.

Ode in Praise of Mathematics. Mount St. Joseph College, Dubuque, Iowa. The Mathematics Teacher, XIX: 487 (December 1926). Single copy 40c.

This "ode" is full of delightful play on words in which mathematical terms figure in unexpected ways.

Plane Geometry. Emma Rounds. See "Creative Youth," edited by Hughes Mearns. Doubleday Page and Co., Garden City, N. Y. $2.50.

A parody on the Jabberwock in "Alice in Wonderland." A very clever verse written by a junior in high school.

A Word to the Foolish and **First Aid in Algebraic Fractions.** Margaret Fezandié. The Mathematics Teacher, XIX: 100-101 (February 1926). Single copy 40c.

These are jolly verses, the first giving suggestions on the solving of quadratics, and the second explaining some of the mysteries of fractions.

See also RECREATIONS AND PUZZLES, p. 43.

MATHEMATICS IN THE PROFESSIONS

A Few Constructive Phases of Mathematics in Life. W. Paul Webber, J. P. Cole and R. L. O'Quin. The Mathematics Teacher, XIX: 449 (December 1926). Single copy 40c.

This shows the use of mathematics in engineering, accounting, the physical sciences, military affairs, and astronomy.

Mathematics Used by the Actuary. John M. Laird. The Mathematics Teacher, XVI: 500-503 (December 1923). Single copy 40c.

Mr. Laird, writing from the Connecticut Life Insurance Company, gives first the preparation required of an actuary, and then treats the problem of making mortality tables. He also discusses the different classes of life insurance and the legal reserve that must be maintained. Although the article is short, it contains much information.

Mathematics for Nurses. David Eugene Smith, C. B. Upton and N. D. Gage. Bureau of Publications, Teachers College, Columbia University, New York City (1918). 25c.

This is especially valuable for its problems on making solutions of specific strength from stock solutions of known strength. It vitalizes this group of problems for students in a high school class.

Probabilities. Joseph M. Synnerdahl. School Science and Mathematics, XXIV: 922-935 (December 1924). Single copy 35c.

This gives the application of probabilities to gambling, insurance, statistical investigations, physics, chemistry, and astronomy.

The Way Mathematicians Work. James Byrne Shaw. The Mathematics Teacher, XVI: 170-174 (March 1923). Out of print. Consult library files.

This gives a summary of a questionnaire conducted by a French journal with the object of discovering the preparation in mathematics of a group of leading mathematicians. It also gives their methods of work, and hints at their hobbies and recreations.

Miscellaneous

A New Number System. H. C. Christofferson. School Science and Mathematics, XXIV: 913-916 (December 1924). Single copy 35c.

A popular discussion of a number system with the base 12 and a comparison with the decimal system.

Words of Classical Derivation in Common Mathematics Vocabulary. The Mathematics Teacher, XIX: 343-348 (October 1926). Out of print. Consult library files.

This brings together, in small compass, interesting facts regarding the words used in work in mathematics. The list is compiled from "The Technical Vocabularies of the Public School Subjects" by Luella Cole Pressey (Public School Publishing Co., Bloomington, Ill.).

See also
Appreciation of Mathematics, p. 111.
Excursions, p. 47.
History of Mathematics, p. 97.
Lantern Slides, p. 70.
Motion Pictures, p. 61.
Plays, p. 75.
Weights and Measures, p. 61.

MATHEMATICS CLUBS. (Add other materials in the space below.)

C. MOTION PICTURES

The motion pictures listed here range from films of strictly mathematical interest to ones only remotely connected with the subject. These pictures are suitable for assemblies, clubs, and mathematics parties, and, in some cases, for classroom instruction. Those dealing with money and banking can be particularly recommended for use in junior high school classes.

Astronomy

Comets. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Shows how comets are formed and how they act. Course of Halley's comet indicated. Sale price $35.00 (314 ft.). Rental price $5.00.

Earth and Moon. General Vision Co., 104 West 42nd St., New York City. 2 reels.

No. 1 (1 reel) shows the phenomena connected with the earth and moon; includes a visit to the moon.

No. 2 (1 reel) shows different phases of the moon, eclipses of sun and moon with the causes.

Park's Popular Science Series. Write for rental and sale prices.

The Earth and Worlds Beyond. 1 reel. Society for Visual Education, 327 South LaSalle St., Chicago, Ill.

Shows cycles of day and night and of the seasons. How the movements of the earth and the moon cause these phenomena. Views of the sun, stars, and planets taken through the largest telescope in existence. Sale price $68.00 f. o. b. Chicago (80 ft.). Rental price $2.00 per day.

The Eclipse of 1925. 1 reel. Pictorial Clubs, Inc., 350 Madison Ave., New York City.

Made under the supervision of "The Scientific American," showing every phase of the phenomenon.

Write for rental and sale price.

Eclipse of the Sun. ½ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

How an eclipse is caused. Animated technical drawings. Sale price $50.00 (455 ft.). Rental price $5.00.

The Eternal Question. 1 reel. General Vision Co., 104 West 42nd St., New York City.

Solar system in pictorial explanation. Park's Popular Science Series. Write for rental and sale prices.

If We Lived in the Moon. ½ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Technical drawings and actual lunar photography, showing conditions as scientists believe them to be on the surface of the moon. Sale price $90.00 (724 ft.). Cannot be rented.

The Mystery of Space. 2 reels. General Vision Co., 104 West 42nd St., New York City.

No. 1 (1 reel) shows a comprehensive view of the Solar System in motion, with Mercury, Venus, Earth, etc., in motion with satellites.

No. 2 (1 reel) shows a full view of Mars, Jupiter, Saturn, Uranus, and Neptune in motion with their satellites.

Park's Popular Science Series. Write for rental and sale prices.

The Solar System. 1 reel. International Church Film Co., 787 Reibold Building, Dayton, Ohio.

The comparative sizes of the planets in the solar system and their distances from the sun. Relation of the moon to the earth. Rental price $3.00. Not for sale.

Tides and the Moon. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Moon's effect on the sea, the influence on tides, etc. Technical drawings and actual photography. Sale price $36.00 (327 ft.). Cannot be rented.

Zones. 1 reel. International Church Film Co., 787 Reibold Building, Dayton, Ohio.

Gives reasons for the establishment of the tropics of Cancer and Capricorn, and boundary lines of various zones. A simple illustration of mathematical astronomy. Write for rental and sale prices.

Business

Checking the Imports. 1 reel. Spiro Film Corp., 161-179 Harris Ave., Long Island City, N. Y.

Activities of United States Collector of Customs. Sale price $110. Rental price $1.50 for one day.

Cooperative Marketing—Cotton. 2 reels. United States De-

partment of Agriculture, Washington, D. C. Rentals free, except for transportation.

Activities of the coöperative cotton marketing associations of the South, showing progress of grower's bale from gin to mill, or to seaboard for export shipment.

Cooperative Marketing—Tobacco. 2 reels. United States Department of Agriculture, Washington, D. C. Rentals free, except for transportation.

Methods followed by coöperative marketing associations among tobacco growers in North Carolina, Virginia, and Kentucky.

A Machine That Thinks. ½ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Graphic history of bookkeeping, particularly a demonstration of modern adding machines. Sale price $64 (580 ft.). Cannot be rented.

Making National Cash Registers. 1 reel. National Cash Register Co., Dayton, Ohio. Free.

Views in the factory at Dayton, Ohio.

Trip Through the National Cash Register Company. 2 reels. State Department of Education, Division of Visual Instruction, 233 South High St., Columbus, Ohio. Free.

This picture is available to teachers of mathematics in the state of Ohio. Free with exception of transportation to and from Columbus.

Geometry

Definition of Plane Geometry. 2 reels. Art Film Co., 1108 Boylston St., Boston, Mass.

This film has been arranged by C. H. Sampson, headmaster of the Huntington School for Boys, Boston, Mass., in connection with the Massachusetts State Department of Education. $3.50 per reel and transportation.

Industry

Men and Management. 3 reels. National Cash Register Co., Dayton, Ohio. Free.

The principles of visual instruction as applied to the elimination of waste in industry.

Waste Can't Win. 4 reels. National Cash Register Co., Dayton, Ohio. Free.

The things that hold back production in a factory and how to eliminate them.

Money and Banking

Department of Treasury. 1 reel. Edited Picture System, 71 West 23rd St., New York City.

The management of national finances, including the bookkeeping department, departments devoted to exchange of new money for old, identification of mutilated money. Rental price $3.00 a day.

The Federal Reserve System. 1 reel. National Board of Y. M. C. A., 120 West 41st St., New York City. Free.

Animated drawings and motion pictures, partly colored, illustrated functions and operations of the Federal Reserve Banks. Requests must be countersigned by local Y. M. C. A. secretary.

Frenzied Finance. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Views of New York's "Wall Street" district, the financial center of the world, with particular emphasis on the Curb Market, a unique human phase of our financial system. Sale price $28.00 (256 ft.). Cannot be rented.

Making a Mint of Money. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

United States Mint in operation. Sale price $20.00 (280 ft.). Cannot be rented.

Modern Banking. 1 reel. Edited Picture System, 71 West 23rd St., New York City.

Depicts the daily routine of up-to-date American banks from within and without. Rental price $3.00 for one day.

Money, Old and New. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Shows work inside the New York Sub-Treasury and the weighing, sorting, and laundering of money. Sale price $23.00 (205 ft.). Cannot be rented.

Money Talks. 1 reel. Prudence Co., 331 Madison Ave., New York City. Free.

Tells the story of a mortgage and of Prudence mortgage bonds.

Romance of a Republic—Department of the Treasury. General Vision Co., 104 West 42nd St., New York City.

Gives a picture of the work of the Department of the Treasury. Rental price $3.00 for one day.

A Trip to Wall Street. 2 reels. H. S. Brown, 806 South Wabash Ave., Chicago, Ill.

A day's work in the world's greatest financial market, the New York Stock Exchange. Write for rental and sale prices.

Under the Spreading Buttonwood Tree. 1 reel. Visugraphic Pictures, 247 Park Ave., New York City. Free.

Historical sketch of the New York Stock Exchange and description of its workings. Actual scenes on the floor of the Exchange—stocks and bonds bought and sold, orders received, transactions recorded, the money desk where lenders meet, and the delivery of securities. An interesting lecture will be sent with this film, if desired. Time of showing: 15 minutes.

Use of Capital in Primitive and Modern Days—Logging. 1 reel. American Motion Picture Corp., 126 West 46th St., New York City.

What capital has wrought in the lumber industry. Write for rental and sale prices.

Physics

Marvels of the Universe—Dewfall. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Experiments to show causes of dewfall, specimens of dew condensation and frost formation under microscope. Sale price $38.00 (344 ft.). Rental price $5.00.

Mysteries of Snow. ½ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

Different kinds of snow crystals and their causes. Sale price $65.00 (595 ft.). Rental price $5.00.

Standard Measures

Don't Cheat Yourself. ¼ reel. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York City.

The Federal Department of Weights and Measures gives the housewife practical demonstration of methods employed by unscrupulous merchants. Sale price $28.00 (253 ft.). Rental price $5.00.

The Principles of Electrical Measurement. 4 reels. Spiro Film Corp., 161-179 Harris Ave., Long Island City, N. Y.

Fundamental measurements of length, mass, and time, electrical standards, theory and construction of electrical measuring instruments, voltmeters, ammeters, wattmeters, powerfactor meters, synchroscopes, frequency .meters, thermoammeters. Sale price $110. Rental price $5.00 per reel for two days.

Thrift

Insurance. 1 reel. State Department of Education, Division of Visual Instruction, 233 South High St., Columbus, Ohio. Free.

Available to teachers of mathematics in the state of Ohio. Free with the exception of transportation to and from Columbus.

Mrs. Brown Versus the High Cost of Living. 1 reel. Society for Visual Education, 327 South LaSalle St., Chicago, Ill.

How one woman made her household budget cover every day's requirements. Briskly and humorously told. Suggestions regarding food selection and preparation. Write direct to society. Sale price $60.00 f. o. b. Chicago. Rental price $2.00 per day.

Time and the Seasons

Day and Night. 1 reel. International Church Film Co., 787 Reibold Bldg., Dayton, Ohio.

Causes of day and night clearly defined. Rental price $3.00. Not for sale.

God Divideth the Night from the Day. 1 reel. General Vision Co., 104 West 42nd St., New York City.

Why we have day and night. Park's Popular Science Series. Write for rental and sale prices.

The Guardian of Time. 2 reels. National Board of Y. M. C. A. 120 West 41st St., New York City. Free.

Story of the making of a watch. Applications from institutions other than Y. M. C. A. must be countersigned by local Y. M. C. A. secretary.

Seasons of the Year. 1 reel. General Vision Co., 104 West 42nd St., New York City.

Animated drawings showing inclination of earth and its position with reference to sun's direct ray at various seasons. Write for rental and sale prices.

Story of a Watch. 2 reels. United States Bureau of Mines, Experiment Station, Pittsburgh, Pa. Free.

Shows entire process of watchmaking by modern methods.

The Story of the Seasons. 1 reel. General Vision Co., 104 West 42nd St., New York City.

Impressive and beautiful exposition of the seasons, and why they change. Park's Popular Science Series. Write for rental and sale prices.

Time. 1 reel. General Vision Co., 104 West 42nd St., New York City.

Clear idea of what time really is: sun time, lunar time, long and short days and nights. Park's Popular Science Series. Write for rental and sale prices.

Time. 1 reel. Standard Film Service Co., 617 Film Building, Cleveland, Ohio.

A color film giving the history of man's efforts to measure time, as recorded in the timepieces of all ages. Write for rental and sale prices.

Equipment

Trans-Lux Daylight Picture Screen, Inc., 247 Park Ave., New York City. Catalogue free.

Trans-Lux Daylight Picture Screen in any size to 18 x 22 feet. Used with any efficient picture projector. Eliminates the trouble and expense of darkening the room.

24 x 30 in., $25.00. 5 x 6 ft., $90.00. 8 x 10 ft., $240.00.

Eastman Kodak Co., Rochester, N. Y.

Motion picture cameras, Model B, Cine-Kodak, $100. Does excellent work under all lighting conditions. Such a machine will add much to the high school equipment in the way of illustrative materials. Pictures of the children at work will prove very stimulating.

Bausch and Lomb Optical Co., Rochester, N. Y. Catalogue free.

Approved projection apparatus. Model B, Balopticon, $65.00. Very good model. With lantern slide attachment, $18.50 extra.

Distributing Agents

Air Reductions Sales Co., 342 Madison Ave., New York City.

American Motion Picture Corp., 126 West 46th St., New York City.

Art Film Co., 1108 Boylston St., Boston, Mass.

Bosworth, De Frenes and Felton, Wilkes-Barre, Pa.

Bray Productions, Inc., 729 Seventh Ave., New York City.

H. S. Brown, 806 South Wabash Ave., Chicago, Ill.

Edited Picture System, 71 West 23rd St., New York City.

General Vision Co., 104 West 42nd St., New York City.

International Church Film Co., 787 Reibold Building, Dayton, Ohio.

National Board of Y. M. C. A., 120 West 41st St., New York City. Free distribution.

National Cash Register Co., Dayton, Ohio. Free distribution.

Pictorial Clubs, Inc., 350 Madison Ave., New York City.

Pilgrim Photoplay Exchange, 1150 South Michigan Ave., Chicago, Ill.

Prudence Co., 331 Madison Ave., New York City. Free distribution.

Society for Visual Education, 327 South LaSalle St., Chicago, Ill.

Spiro Film Corporation, 161-179 Harris Ave., Long Island City, N. Y.

Standard Film Service Co., 617 Film Building, Cleveland, Ohio.

United States Bureau of Mines, Experiment Station, Pittsburgh, Pa. Free distribution.

United States Department of Agriculture, Washington, D. C. Free distribution.

Urban Kineto Corp., Irvington-on-Hudson, N. Y.

Visugraphic Pictures, 247 Park Ave., New York City.

Consult the department of education and the state museum of your own state for films that may be used without charge other than transportation within your state.

MOTION PICTURES. (Add other films in the space below.)

D. LANTERN SLIDES

The following list of lantern slides is by no means exhaustive. In many cases slides on astronomy and engineering, and slides of great scientists and mathematicians may be obtained from collections made by various state departments of education or by state museums. These are available only for circulation within the state.

Society for Visual Education. 327 LaSalle St., Chicago, Ill. Catalogue on request.

This organization will give information on any type of visual instruction material. Send for free handbook describing material and listing slides, and ask to be placed on mailing list. "The Visual Review" is published annually, and is distributed to schools, teachers, and libraries upon request.

Astronomy

Astronomy. 18 slides. New Jersey State Museum, Trenton, N. J.

A group of slides on astronomy with accompanying lecture. Free to institutions within the state of New Jersey.

Pennsylvania State Museum, Harrisburg, Pa.

A large collection of slides on astronomy for use by schools, churches, institutions, and individuals within the state, the only charge being for shipping and breakage.

Among these slides are ones showing the various theories of the form of the universe, the signs of the zodiac, comparative size of planets. The physics slides include several on mechanics which would be very useful in a mathematics assembly or club meeting.

Pilgrim Photoplay Exchange. 804 South Wabash Ave., Chicago, Ill. Catalogue free.

This firm has twenty-four slides on various astronomical subjects, including four slides of the visible heavens at different seasons of the year.

Plain slides, 50c each; colored slides, $1.00 each. Rental price, 6c.

University of Chicago Press, Chicago, Ill.

A collection of over 800 lantern slides made from astronomical negatives at the Yerkes Observatory.

Plain slides, 75c each; colored slides, $1.25 and $1.50 each; special collection of 100 slides, $62.50, carriage extra.

Victor Animatograph Company, Inc., Davenport, Iowa.

This company will furnish lectures with over 40 lantern slides each. The titles are:

No. 146—The Tools of the Astronomer.
No. 148—The Plurality of Habitable Worlds.
No. 149—The Earth in the Universe.
No. 150—Worlds in the Making.
No. 151—The Law of Universal Gravitation.
No. 152—The Revelations of the Spectroscope.

Plain slides, 35c each; colored slides, 55c each. Rental price $2.50 plus postage for each lecture.

Geometric Design

The American Museum of Natural History, Columbus Ave. and 77th St., New York City. Descriptive leaflet free.

This museum has a collection of slides illustrating many phases of natural science. Among these are pictures showing the symmetry of snowflakes, butterflies, and microscopic animals; the geometric forms of primitive shelters, and the geometric ornamentation in the primitive handicrafts of weaving, pottery, and basketry. Slides may also be obtained for astronomy.

There is no printed list of titles, but complete information on the material can be obtained from Mr. George H. Sherwood, Curator of Public Education, American Museum of Natural History, New York City.

Plain slides, 50c; colored slides, $1.25. The following list of slides is suggested:

Astronomy in Celestial Bodies

37336 Solar—Corona—June 8, 1918, taken with 38′ camera
36584 Shooting Star—Nebulae of Cygnus at the right

Indian Art (showing geometric designs in primitive ornament)

101349 Arizona—Pima Pottery
101585 Aztec—New Mexico Pottery Vessel
34005 Apache Baskets—Arizona
36797 Arizona Apache Baskets
32389 Painted Buckskin Skirt of Shamans
34106 Prehistoric Blanket—found in Grand Gulch, Utah
32824 Arizona—Navajo Blanket
32827 Arizona—Navajo Blanket
33463 Mindanao, Philippine Islands—Man's carrying bag
14317 New Mexico—New Mexico Tepee and Brush Shade
33045 Philippine Tree House
34011 Group showing Navajo Home Life and Industries

PLANT LIFE (showing various types of symmetry)

212713 Turpentine Grove of Long Leaved Pines
102607 Pitch Pine Cones—Woods Hole, Mass.
288596 Beauty Peaches
102387 Daisy Field
228153 Trailing Arbutus
238643 Eastern Prickley Pear
235540 Black-Eyed Susan
102418 Common Fall Mushroom
239037 Indian Cucumber

ANIMAL LIFE (showing types of symmetry)

101058 Ammonites
33752 Radiolarian (Siderastrea)
31449 Skeleton of Radiolarian 85 Families
102656 Star Fish
102809 Leaf Butterfly
102805 Tiger Swallowtail Butterfly
103006 White Eyed Vireo and Nest
37127 Spider Web
32980 Nest Made by Honey Bee
102761 Luna Moth

History of Mathematics and Modern Uses of Mathematics

Bureau of Publications, Teachers College, Columbia University, New York City.

This publisher has negatives of more than 250 lantern slides illustrating the development of arithmetic, the growth of algebra, geometry, trigonometry, analytic geometry, the calculus, and mechanical methods of computation. These slides are without question the best obtainable in these fields. A list of titles will be sent on application to the Bureau. Three weeks should be allowed in placing an order. Price 80c each in orders of 6 slides or more.

Portraits of Mathematicians

Central Scientific Co., Chicago, Ill.

S 28 Arago
S 21 Archimedes (2 slides)
S 37 Aristotle
S 123 Tycho Brahe (2 slides)
S 228 Copernichus (3 slides)
S 312 Einstein
S 362 Franklin (5 slides)
S 365 Galileo (2 slides)
S 460 Edmund Halley
S 515 Huygens (2 slides)
S 537 Kepler (3 slides)
S 564 Laplace (2 slides)

S 690 Newton (3 slides)
S 736 Pascal
S 906 Torricelli (2 slides)
S 978 Young (2 slides)

Each slide, 85c; ten slides, $6.00.

Physics

Practical Physics, Vol. I. Bray Productions, Inc., Dept. of Education and Public Service, 729 Seventh Ave., New York.

Each of the following topics is covered in a thorough manner with approximately 35 pictures to the set, including tables, maps, charts, and photographs.

1. The Metric System—27
2. Work—52
3. Levers, Part I—40
4. Levers, Part II—55
5. Pulleys—48
6. Inclined Plane—56
7. Screws—49
8. Gears—58
9. Friction—67
10. Power—41
11. Efficiency—29
12. Pressure in Liquids, Part I
13. Pressure in Liquids, Part II—45
14. Air Pressure, Part I—48
15. Air Pressure, Part II—55
16. Non-Parallel Forces—45
17. Strength of Materials—57
18. Accelerated Motion—49
19. Inertia, Including Centrifugal Force—44
20. Energy—53

Prepared by A. Haven Smith, Principal, Redlands (Calif.) High School, and H. J. Hanna, Teacher of Physics, Los Angeles (Calif.) High School.

Series of 20 rolls of film, with manuals, in case, $50.00; single film, $3.00.

Equipment

Bausch and Lomb Optical Co., Rochester, N. Y. Catalogue on request.

Approved projection apparatus. Model B. Balopticon, $65.00. Model very good. With lantern slide attachment, $18.50 extra.

Charles Beseler Co., 131 East 23rd St., New York City. Catalogue on request.

Approved projection apparatus.

Brayco Projector. Bray Productions, Inc., 729 Seventh Ave., New York City. Catalogue free.

Still-picture projector, using strips of standard-size, non-inflammable picture film. Each film from 16 to 100 separate pictures. Complete with standard lens, $35.00.

Filing Lantern Slides. Equipment obtainable from

Multiplex Display Fixture Co., 918 North Tenth St., St. Louis, Mo. Catalogue on request.

Victor Animatograph Co., Davenport, Iowa. Catalogue on request.

LANTERN SLIDES. (Add other materials in space below.)

E. PLAYS

The following plays are suitable for meetings of a mathematics club or for use in an assembly. In most cases it is possible to introduce additional characters. Costumes and properties are simple. The study of a number of these plays might easily stimulate a group to write a mathematics play of its own. The desire to write or give a play might also come through the reading of Abbott's "Flatland" or Leacock's "Human Element in Mathematics."

The Adventures of X. Clark, Newlin and Smothers. D. C. Heath and Co., 239 West 39th St., New York City. 48c.

A play dealing with the land of Algebra.

The Evolution of Numbers, an historical drama in two acts. H. E. Slaught. American Mathematical Monthly, XXXV: 146-151 (March 1928). Single copy 60c.

The theme of this play is the evolution of our number system by the addition of negative numbers, zero, fractions, irrationals, and complex numbers. This restricts the audience before whom the play may be presented, but on the other hand it offers an excellent treatment of the reluctance with which these numbers were received into the number system. It is one of the few plays dealing with mathematical material whose air is to instruct as well as to amuse.

Falling in Love with Plain Geometry. Caroline Hatton and Doris H. Smith. The Mathematics Teacher, XX: 389-403 (November 1927). Copies of the play may be obtained from Caroline Hatton, 537 West 121st St., New York City. 40c.

One of the best of the plays for senior high school students. Sixteen characters; eleven girls, five boys.

Flatlanders. A Mathematical Play in One Act. Kathleen Millay and Lucile Free. American Mathematical Monthly, XXVI: 264-267 (June 1919). Single copy 60c.

A play presented by the Mathematics Club at Vassar in 1919. This play, like others of its class, is founded on Abbott's "Flatland," and much of the dialogue is lifted bodily from that work.

Geometry Humanized. Emma Scott. The Mathematics Teacher, XXI: 92-102 (February 1928). Single copy 40c.

A play in one act with eighteen characters. More may be added. Costumes and properties are simple but effective. The dialogue is interesting and full of entertaining puns. It can be highly recommended for production by classes in plane geometry.

A Little Journey to the Land of Mathematics. Alma E. Crawford. The Mathematics Teacher, XVII: 336-342 (October 1924). Out of print. Consult library files.

A play showing the many uses of mathematics to astronomer, chemist, bookkeeper, draftsman, dietitian, and others. Suitable for junior high school or for a ninth grade. Twenty-six characters.

The Mathematical Quest. Helen Whitaker. School Science and Mathematics, XX: 457-459 (May 1920). Single copy 35c. Reprinted in The Mathematics Teacher, XVIII: 356-358 (October 1925). Out of print. Consult library files.

A May Day play in verse, requiring fifty characters; two speaking parts. It implies a knowledge of equations.

Mathesis. Ella Brownell. The Mathematics Teacher, XX: 459-465 (December 1927). Single copy 40c.

A play for junior high school students. Fifteen parts, but more may be added. Simple costumes and stage sets. Provision for incidental music.

The Mock Trial of B versus A. Kathryn McSorley. School Science and Mathematics, XVIII: 611-621 (October 1918). Single copy 35c.

This play follows Stephen Leacock's "Human Element in Mathematics" with the introduction of additional material that is quite in harmony with Leacock's humor.

The New Assistant. Alton L. Hall. The Metric Association, 156 Fifth Ave., New York City. 25c.

A play included in the collection of pamphlets distributed by The Metric Association. It deals with the advantages of the metric system and the countries that have adopted it. Ten to fifty-nine characters; ten speaking parts.

A Number Play in Three Acts. Tillie Schlierholz. The Mathematics Teacher, XVII: 154-169 (March 1924). Out of print. Consult library files.

This play was dramatized by an eighth grade class in the Ben Blewett Junior High School of St. Louis, under the direction of Miss Schlierholz. The play is based on Professor David Eugene Smith's "Number Stories of Long Ago."

A Project in Thrift Education. Presented by the Thomas A. Edison Junior High School, Los Angeles, Calif. Address:

Savings Bank Division, American Bankers Association, 110 East 42nd St., New York City.

A play built about the idea of school savings banks. The pamphlet tells in detail how the play was written, how the costumes were made, and how the scenery was built.

Socrates Teaches Mathematics. Norman Anning. School Science and Mathematics, XXIII: 581-584 (June 1923). Single copy 35c.

Showing the development of $(x + y)^3$ and $(x - y)^3$, using blocks to illustrate the various terms.

PLAYS. (Add other materials in the space below.)

III. PRACTICE TESTS AND EXERCISES

The practice exercises listed below are designed for rapid drill or for remedial work, but they should not be considered as constituting a curriculum in mathematics. Neither should the tests given here be considered as giving a complete analysis of a student's mathematical ability.

A. JUNIOR HIGH SCHOOL MATHEMATICS

Diagnostic Tests

Diagnostic Test for Fundamental Processes in Arithmetic. G. T. Buswell and Lenore John. Public School Publishing Co., Bloomington, Ill.

Each pupil is tested individually, doing his work *aloud*. The diagnostic chart gives a systematic list of the types of mistakes and the wrong habits most likely to occur.

Package of 50 copies of the test (or Pupil's Work Sheet), 50 copies of Teacher's Diagnostic Charts, and one Manual of Directions, $2.50. Manual of Directions, 15c each. Teacher's Diagnostic Chart, 3½c each. Pupil's Work Sheet, 2c each. Sample set, 20c.

Compass Diagnostic Tests in Arithmetic. G. M. Ruch, F. B. Knight, H. A. Greene and J. W. Studebaker. Scott Foresman and Co., Chicago, Ill. (20 tests), Grades 2 to 8.

These tests are designed to discover a pupil's disabilities and each test is a unit in itself. Accordingly, it is possible for a class to use only the tests which are particularly applicable to its needs. Each test is divided into several parts with the object of separating the component skills that are to be tested. For example, Test XVIII on problem analysis is divided into: comprehension, what is given, what is called for, probable answer, correct solution.

Packages of 25 tests, with record blank and answer key, 25c to $1.25. Specimen set 60c. Teacher's manual 20c. See list below.

The topics treated and the price per package of 25 tests are:

Test I, Addition of Whole Numbers, 25c.
Test II, Subtraction of Whole Numbers, 25c.
Test III, Multiplication of Whole Numbers, 50c.
Test IV, Division of Whole Numbers, 50c.
Test V, Addition of Fractions and Mixed Numbers, 50c.
Test VI, Subtraction of Fractions and Mixed Numbers, 25c.
Test VII, Multiplication of Fractions and Mixed Numbers, 25c.

Test VIII, Division of Fractions and Mixed Numbers, 50c.
Test IX, Addition, Subtraction, Multiplication of Decimals, 50c.
Test X, Division of Decimals, 50c.
Test XI, Addition and Subtraction of Decimals, 50c.
Test XII, Multiplication and Division of Decimals, 50c.
Test XIII, Mensuration, $1.00.
Test XIV, Basic Facts of Percentage, $1.00.
Test XV, Interest and Business Forms, $1.00.
Test XVI, Definitions, Rules, and Vocabularies of Arithmetic, 50c.
Test XVII, Problem Analysis (5-6), $1.25.
Test XVIII, Problem Analysis (7-8), $1.25.
Test XIX, General Problem Scale (5-6), 25c.
Test XX, General Problem Scale (7-8), 25c.

Monroe Diagnostic Arithmetic Tests. Walter S. Monroe. Public School Publishing Co., Bloomington, Ill.

This series of tests gives diagnostic measures of arithmetical abilities in the operations with integers and fractions. There are a total of 21 subtests. Part I (Integers, Grades 4 to 8) is composed of tests 1-6; Part II (Integers, Grades 5 to 8), tests 7-11; Part III (Common Fractions, Grades 6 to 8), tests 12-16; and Part IV (Decimal Fractions, Grades 6 to 8), tests 17-21. Each test is devoted to a particular type of example and each yields its own score. Standards are provided for each of the 21 tests.

Each part 85c per 100 copies. Sample set 10c.

Wisconsin Inventory Tests in Arithmetic. Public School Publishing Co., Bloomington, Ill.

The subject matter of these tests includes the number combinations needed in short division, column addition, carrying in multiplication and division. Tests IV—VIII have norms for the seventh grade. Tests IV, VI, VII, and VIII for the eighth grade.

Test I, Inventories, Attainment in the 100 combinations in Simple Addition, $1.00 per 100.

Test II, Inventories, 100 combinations in Subtraction, $1.00 per 100.

Test III, Inventories, 100 combinations in Multiplication, $1.00 per 100.

Test IV, Inventories, 100 combinations in Division, $1.00 per 100.

Test V, Inventories, Higher Decade Addition Facts, $1.00 per 100.

Test VI, Inventories, Combinations for Carrying Multiplication, $1.00 per 100.

Test VII, Inventories, Zero Quotient Combinations in Short Division, $1.00 per 100.

Test VIII, Inventories, Major Difficulties in Long Division, $1.00 per 100.

In quantities less than 100, 1¼c per copy. Specimen set, all tests, 12c.

Practice Exercises

The Clapp Drill Book in Arithmetic, Seventh and Eighth Year. Frank Leslie Clapp. Silver Burdett and Co., 41 Union Sq., New York City. 48c each.

Each book contains diagnostic work, remedial work, miscellaneous exercises, drills and concrete problems. Thus provision is made for meeting individual difficulties. Answers are given in each book.

Courtis Standard Practice Tests in Arithmetic, Grades 4 to 8, 1920 Revision. S. A. Courtis. World Book Co., Yonkers, N. Y.

These exercises consist of a series of 48 graded lessons, each printed on a heavy card. The cards of this set are permanent equipment; each pupil is provided with a tablet of transparent paper, the card being slipped beneath the transparent sheet and the answers being written on it.

The prices range from a 12-pupil set of practice cards for $2.00 to a 48-pupil set for $8.50. The larger sets include a cabinet for storing the material. Specimen set $1.50.

Fowlkes-Goff Practice Tests in Arithmetic. Grades 7, 8 and 9. J. G. Fowlkes and T. T. Goff. The Macmillan Co., 60 Fifth Ave., New York City. 68c.

Ninety-five practice tests and five achievement tests so arranged that the separate sheets may be torn out and the pupil's record kept on the cover of the test booklet.

Instructional Tests in Arithmetic. Grades 7 and 8. Raleigh Schorling, John R. Clark and Mary Potter. World Book Co., Yonkers, N. Y. In press.

In these tests, a child's ability is measured by preliminary inventory tests. The successful passing of the tests permits him to continue with advanced work. Failure necessitates the use of remedial exercises also printed in the pamphlet. The exercises and tests are self-checking and x, y, and z scores are given.

Lennes Test and Practice Sheets in Arithmetic. N. J. Lennes. Grades 2-8. Laidlaw Bros., Chicago, Ill. 36c.

These tests are in tablets, one for each year. The tablets contain practice sheets in basic facts, percentages, simple interest, and the like; standardized test sheets, thirty-two of which are given in each of the seventh and eighth grade tablets; and problem sheets. Individual score cards are provided for the pupils and the answers to each group of questions are given on the back of the page.

Mastery Units for Individual Learning. Edited by James E. McDade. Plymouth Press, 7850-56 Lowe Ave., Chicago, Ill.

These units are designed for self-study and self-testing. The study units consist of a folder and a card of heavy paper. By slipping the card into the holder, one problem is visible at a time through a window in the card, and by sliding the card the answer appears beside the problem. By reversing the folders the cards may also be used for testing, in which case the answers remain covered.

Study cards 30c per dozen. Folders 50c per dozen. Record cards 50 for 30c.

Addition, 3 study units, 40c.
Bridging the Decades, 6 study units, 30c.
Adding by Endings, 6 study units, 85c.
Column Addition, 7 study units, each 15c.
Subtraction Facts, 1 study unit, 40c.
Borrowing, 1 study unit, 15c.
Subtracting from 100, 1 study unit, 15c.
Multiplication Facts, 1 study unit, 40c.
Division, 1 study unit, 40c.
Terms Used in the Fundamental Processes, 1 study unit, 15c.
Graphic Fractions, 1 study unit, 15c.
Graphic Reduction of Fractions, 1 study unit, 15c.
Terms Used in Fractions, 1 study unit, 15c.
Percentage Graphs, 1 study unit, 15c.
Accurate Measurement, 2 study units, each 50c.
Inventory Test of Number Facts, 4 tests, 55c.

Practical Exercises in Rapid Calculation. Earle Powers and Harold W. Loker. Ginn and Co., 70 Fifth Ave., New York City. 56c.

This is an exercise pad with perforated work sheets giving graded drills in fundamental operations, fractions, percentages, and interest. Review exercises are included.

The Teacher's Manual gives the standards for the tests and the time that should be allowed for doing them.

Studebaker Economy Practice Exercises in Arithmetic. John Ward Studebaker. Scott, Foresman and Co., Chicago, Ill.

This is a set of fifty exercises, each printed on a card with a space cut out beneath each example so that the problem may be worked on paper placed beneath the card. The cards are self-checking, the answers being printed on the back of the card. The time needed for administering the exercises varies from 7 minutes in the fourth grade to 4 minutes in the eighth grade. Each pupil keeps his record of "Attempts and Rights" in his own folder.

Set B—One for 50 pupils, $18.00.
Set B—Two for 18 pupils, $7.50.
Set B—Three for 9 pupils, $3.50.
Set B—Four for 1 pupil, $2.00.

Achievement Tests

Buckingham Scale for Problems in Arithmetic. B. R. Buckingham. Div. III (Grades 7-8). Two forms. Public School Publishing Co., Bloomington, Ill. 80c per 100.

The three parts of this scale overlap to some extent, but the problems on each are arranged in order of difficulty. A pupil's score is the number representing the difficulty of the hardest problem he solves correctly, with a deduction for each problem which is missed before that point. The two forms of the scale provide for retesting.

Cleveland Survey Arithmetic Tests. (Grades 3-8.) Public School Publishing Co., Bloomington, Ill. $1.90 per 100 copies; sample set 10c.

"The test is arranged on the spiral plan, the exercises in the four fundamental operations increasing in difficulty with each repetition. This arrangement gives opportunity to diagnose each pupil's attainment in the use of numbers. Form 1 for first testing; Form 2 for second testing."

Kinney Scale of Problems in Commercial Arithmetic. L. B. Kinney. Public School Publishing Co., Bloomington, Ill.

"In selecting the material for these tests, every effort was made to select problems that are of real importance in the work of such businesses as the commercial arithmetic courses are intended to prepare pupils for. The problems were collected from merchants, wholesale dealers, and other business men, and from teachers."

Test A, Parts I and II, are intended for use at the end of the first semester. These tests cover work in the fundamentals, especially work in short-cut methods and in aliquot parts. Test B (Forms 1 and 2 for repeated testing) presents fairly simple problems in commercial arithmetic; it is intended for use at the close

of the first semester. Test C (Forms 1 and 2) is devised for use at the end of the second semester. The tests include diagnostic and remedial features.

Packages of 25 tests and a direction booklet $1.00. Sample set 25c.

Monroe General Survey Arithmetic Test. Walter S. Monroe. Public School Publishing Co., Bloomington, Ill.

This is a survey test in the fundamental operations in arithmetic. Scale I (Grades 3, 4, 5) is composed of 8 sets of tests (2 for each of the fundamental operations) bound in one test booklet. Scale II (Grades 6, 7, 8) consists of 7 sets of tests, including two tests in common fractions and one test in decimal fractions, bound in one test booklet. There are three forms of each test; three testings are thus provided for.

100 copies of one scale $1.00. Sample set 15c.

Monroe Standardized Reasoning Tests in Arithmetic. Walter S. Monroe. Public School Publishing Co., Bloomington, Ill.

The norms for these tests are based on a time allotment of 25 minutes, and in scoring a correct method receives partial credit even though there may be arithmetic errors in the work. Test II is for Grades 6 and 7. Test III is for Grade 8.

Any test or form, per 100, 90c. In quantities less than 100, 1c per copy. Specimen set, any test, both forms, 10c. Specimen set, all tests and forms, 20c.

Otis Arithmetic Reasoning Test. Arthur S. Otis. Grades 4 to 12. World Book Co., Yonkers, N. Y.

"Test 5 of the Otis Group Intelligence Scale, Advanced Examination, prepared in response to an insistent demand for a valid and reliable reasoning test. A recent university study has shown this test to be more reliable and a better test of arithmetic reasoning than most arithmetic tests, even those requiring 20 to 30 minutes to administer."

The tests, of 2 pages, are put up in packages of 25 with directions, key, and class record, 40c. There are two forms, A and B. Specimen set 10c.

Pittsburgh Arithmetic Scales. Public School Publishing Co., Bloomington, Ill.

"These are diagnostic tests in the four fundamentals for Grades 3 to 9. They were very carefully designed and standardized by the research department of the Pittsburgh, Pa., Public Schools. Grade norms, year norms, and age norms are provided. The three forms

(Forms A, B, and C) are of equal difficulty and can be used to determine the pupils' progress during the school year."

100 copies of one form $1.00. Sample set 10c.

Stanford Achievement Test. Truman L. Kelley, Giles M. Ruch, Lewis M. Terman. World Book Co., Yonkers, N. Y.

This is part of a comprehensive test in arithmetic, reading, spelling, science information, history and literature, and language usage. and may be used through the eighth grade. "Age norms, as well as grade norms, are supplied for all the tests, thus making possible for the first time the derivation of a satisfactory educational quotient (EQ)."

Arithmetic Examination (Form A or Form B), 6 pages. Package of 25 Examination Booklets, including Key and Class Record, $1.00. Manual of Directions 30c.

Stevenson Arithmetic Reading Test (Problem Analysis). P. R. Stevenson. Public School Publishing Co., Bloomington, Ill.

The purpose of this test is to measure the pupil's ability to read a problem, to analyze it, telling what facts are given and what ones are to be found, to judge which of several answers is reasonable, and to tell which of several processes should be used in finding the solution.

Test II (Grades 7-9), two forms, $1.00 per 100. Sample set 10c.

New Stone Reasoning Test in Arithmetic, Forms 1 and 2. Cliff W. Stone. Bureau of Publications, Teachers College, Columbia University, New York City.

"The new (1927) Stone Reasoning Test in Arithmetic is designed as a successor to the original Stone Test (1908). It is an extension and improvement of the original test in the following respects: (*a*) Easier and harder problems have been added and the number increased from 12 to 21. (*b*) The selection and arrangement of the problems are improved. (*c*) The time limit is removed. (*d*) The scoring time is reduced. (*e*) T scores and age and grade standards are provided. (*f*) The two Forms are more nearly equivalent. For Grades 4 to 9."

Form 1 or Form 2, $1.25 per 100. Manual of directions, class portrayal chart, class diagnostic sheet, 65c. Specimen set 75c.

Witham Arithmetic Tests. E. C. Witham. J. L. Hammett Co., 380 Jelliff Ave., Newark, N. J.

"General Supervisory Tests, consisting of the essentials of several tests in one; fractions, decimals, percentage, and denominate numbers for grades 3 to 8 inclusive."

Package of 50 of any test, $1.00. In quantities less than 50, 2¼c per copy and 10c extra for class record sheet and scoring key. Specimen set 15c.

Woody Arithmetic Scales. Series A and Series B. Clifford Woody. Bureau of Publications, Teachers College, Columbia University, New York City.

"A measure of the achievement of a group, a class, or an entire school system in the four fundamentals of arithmetic. The scale comprises two series of equal difficulty, Series A and B. Series A, the long series, is valuable especially for diagnostic purposes. Series B, the short series, is valuable for survey purposes. Testing time, 20 minutes for each test of Series A; 10 minutes for each test of Series B. Two alternate forms of Series B are available, Form B and Form B2. Grade Standards are provided."

Series A (4 separate sheets) $2.00 per 100. Series B (4-page folder) $1.50 per 100. Directions and record sheets included with orders. Specimen set 20c.

Woody-McCall Mixed Fundamentals in Arithmetic. Forms I, II, III and IV. Clifford Woody and W. A. McCall. Bureau of Publications, Teachers College, Columbia University, New York City.

"A special arrangement of the Woody Arithmetic Scales made by Dr. W. A. McCall. Problems selected from the addition, subtraction, multiplication, and division scales have been combined on one sheet and scaled, the particular process involved being indicated for each problem. The four forms are of equal difficulty and can be used to test the same pupils four times. Grade standards are provided. Testing time 20 minutes."

Each form of the test 60c per 100. Directions and record sheets included with orders. Specimen set 20c.

Work Books and Practice Exercises in Intuitive Geometry and General Mathematics

Tests and Exercises in Junior High School Mathematics. D. E. Smith, W. D. Reeve, E. L. Morss. Ginn and Co., 70 Fifth Ave., New York City.

These books of exercises give practice in the different phases of junior high school mathematics. The tests are printed on the two

sides of the leaf, which is perforated so that the exercises may be removed if this is desired. The printing is excellent.

Grades VII and VIII, 48c each. Grade IX in press.

Work Book in Intuitive Geometry. For Junior High School. William Betz, A. Brown Miller, and F. Brooks Miller. The Harter School Supply Co., 2046 East 71st St., Cleveland, Ohio. 80c.

"This Work Book in Intuitive Geometry has been carefully compiled, presenting in a practical way the study of form, position, and size. Such a treatment of the subject is not only extremely valuable in itself but is an excellent foundation for the study of algebra and formal geometry. The authors have provided adequate developmental material, thus making this work book more than a supplementary exercise book. It may be used independent of any other text on this subject."

JUNIOR HIGH SCHOOL MATHEMATICS. (Add other materials in the space below.)

B. ALGEBRA

Practice Exercises

CBA Hurdle Tests. Mabel Sykes and Clarence E. Comstock. (Sykes-Comstock Series). Rand McNally Co., 270 Madison Ave., New York City. 60c per booklet, net school price.

These tests are issued in nineteen booklet forms as follows:

1. Operations on equations.
2. Translations.
3. Evaluations.
4. Collecting terms.
5. Use of negative number.
6. Graphs.
7. Solution of sets of equations.
8. Factoring.
9. Solving equations.
10. Multiplication (expanding).
11. Use of exponents.
12. Fractions.
13. Solving quadratics.
14. Stating problems.
15. Clearing equations of fractions.
16. Solving formulas.
17. Graphs.
18. Solving sets of equations.
19. Radicals.

Exercises and Tests in Algebra through Quadratics. D. E. Smith, W. D. Reeve, E. L. Morss. Ginn and Co., 70 Fifth Ave., New York City. 60c.

This booklet consists of 224 exercises covering many topics of the elementary course. The tests are on perforated pages which may be torn out if desired. The tests are paired so that additional work on the same topics may be given or retests made. "Exercises and Tests in Algebra beyond Quadratics" by the same authors is in press.

Instructional Tests in Algebra. Raleigh Schorling, John R. Clark, Selma Lindell. World Book Co., Yonkers, N. Y. 28c.

A book of practice tests in ninth grade algebra. This is self-checking and x, y, and z scores are given.

Work Book in Algebra. For Junior and Senior High Schools. G. C. Myers, E. J. Thomas and K. M. Persing. The Harter School Supply Co., 2046 East 71st St., Cleveland, Ohio. 80c.

Part I includes equations, positive and negative numbers, fundamental operations, graphs, and factoring. With 25 tests on the subjects covered. The work book is self-teaching, developing the theory by sample problems and short explanatory notes. Answers

are given to both exercises and tests, but these are on perforated sheets that may be removed if the teacher desires.

Part II in preparation.

Practice Exercises in Algebra. J. F. Gonnelly, L. G. Huff, J. W. Studebaker. Scott, Foresman and Co., 623 Wabash Ave., Chicago, Ill.

These exercises resemble the Studebaker Economy Practice Exercises in Arithmetic in their use of a cardboard sheet with perforations which permit all written work to be done on a sheet of paper placed beneath the card. The exercises are self-checking.

The cards come in sets for each of the first two semesters of algebra. Set A: I, 30 pupils, 19 exercises, 1st semester, $12.00. Set A: II, 30 pupils, 23 exercises, 2nd semester, $15.00. Set B (both semesters), 15 pupils, $15.00.

Tests

Columbia Research Bureau Algebra Test. Arthur S. Otis and Ben D. Wood. World Book Co., Yonkers, N. Y.

"The test consists of two parts. Part I is a test of ability in the mechanical operations; Part II is a test of the ability to solve problems. The twenty items of Part I cover the essential operations of first year algebra. The twenty problems of Part II are all real problems. They are scored as to correctness of both the equation and the solution.

"Special provision for the writing of answers in columns on the cover pages simplifies the scoring."

Package of 25 examination booklets (either Form A or Form B), with Manual of Directions, Key, and Class Record, $1.30 net. Specimen set 20c.

Hotz First Year Algebra Scales. Henry G. Hotz. Bureau of Publications, Teachers College, Columbia University, New York City.

"The Hotz Algebra Scales may be used: to indicate attainment, to measure progress, and to diagnose difficulties. They are instruments for measuring the abilities of classes rather than of individuals.

"There are five different scales: 1. Addition and Subtraction. 2. Multiplication and Division. 3. Equation and Formula. 4. Problems. 5. Graphs. Two series of each scale (with the exception of Graphs) are available. Series B, the long series, is composed of from 18 to 25 exercises in each scale and is valuable from the standpoint of diagnosis. Series A, the short series, is composed of exercises taken from Series B—from 8 to 12 to a scale, and is especially useful when time is limited. Time for Series A, 20-25 minutes per scale; for Series B, 45 minutes per scale.

"If only one scale can be used the Equation and Formula Scale is recommended. At least two scales should be used when possible, and the Problems Scale comes next in importance."

Graph scale, $1.25 per 100; other scales, 70c per 100. Manual of Directions, 75c. Specimen set, 75c.

Illinois Standardized Algebra Test. Public School Publishing Co., Bloomington, Ill. Sample set 15c. $2.50 per 100.

"The test is based upon the simple equation since the simple equation constitutes a very large part of the work of the first year in algebra. The test consists of four parts, each of which contains twenty exercises. In Part 1, the two unknown quantities are in the first member of the equation; in Parts 2, 3, and 4, there is one unknown in each member. Part 3 differs from Part 2 in that it involves the parenthesis. In Part 4 the fractional form is found in both members of the equation."

ALGEBRA. (Add other materials in the space below.)

C. GEOMETRY

Diagnostic Tests

Minnick Geometry Tests. J. H. Minnick. Public School Publishing Co., 509 North East St., Bloomington, Ill.

This test is designed to cover four different phases of ability in geometry. Any one may be given separately. The topics are:

Test A. Drawing figures for propositions.

Test B. Stating what is given and what is to be proved.

Test C. Stating additional facts about given figures.

Test D. Organizing a proof from given data.

Each test $2.50 per 100. Sample set 20c.

The Renfrow Diagnostic Tests in Plane Geometry. O. W. Renfrow. Bureau of Administrative Research, University of Cincinnati, Cincinnati, Ohio.

"This series consists of two tests of two forms each covering the fundamentals of Plane Geometry. Test I, Forms A and B, consists of Definitions, Axioms, and Postulates; Construction and Locus Problems; Theorems; and Exercises and Problems. This part of the test deals with lines, triangles, polygons, and circles, and covers the first semester's work in Plane Geometry. Test II, Forms A and B, covers the work ordinarily presented in the second semester. The tests have been carefully prepared and standardized and provide a satisfactory means of determining the student's achievement in Plane Geometry. One highly commendable feature of the tests is the fact that the scoring device makes it possible to score a test in about three minutes."

Package of 25, including class record and score cards, $1.00. In quantities less than 25, 5c per copy and 5c extra for class record sheet and score card. Specimen set, any form, 10c; all forms, 35c.

Exercises and Tests in Plane Geometry. D. E. Smith, W. D. Reeve, E. L. Morss. Ginn and Co., 70 Fifth Ave., New York City. Price 64c.

A booklet of tests and exercises in plane geometry following the arrangement of the Exercises and Tests in Junior High School Mathematics and in Algebra by the same authors. A wide variety of tests is included and the booklet is sure to be very useful.

Achievement Tests

Columbia Research Bureau Plane Geometry Test. Herbert E. Hawkes and Ben D. Wood. World Book Co., Yonkers, N. Y.

"This test includes questions and problems covering the more important aspects of plane geometry common to most of the textbooks in general use. There are two parts to the test, Part I being made up of 65 true-false statements concerning many aspects of the subject; and Part II being composed of 35 problems designed to bring out the student's ability in geometric reasoning.

"A Supplement to the Manual of Directions makes provisions for giving an augmented test where it is desired to give a supplementary or more extended examination."

Package of 25 examination booklets (either Form A or Form B), with Manual of Directions, Key, and Class Record, $1.20 net. Specimen set 25c.

Hart's Geometry Tests. W. W. Hart. D. C. Heath and Co., 231 West 39th St., New York City. $1.68 for 20 copies of each test.

These are five tests, one for each book of the plane geometry, and each test deals with the recognition and application of fundamental theorems. The tests are of the "short answer" type and are easy to administer and quick to score.

Schorling-Sanford Achievement Test in Plane Geometry. Forms A and B. Raleigh Schorling and Vera Sanford. Bureau of Publications, Teachers College, Columbia University, New York City.

"A new-type final examination, covering each of the five books of plane geometry, designed to be given at the close of the geometry course to replace or to supplement the usual essay type of examination. The two forms of the test are parallel. Each form consists of five parts of twelve questions each. Time 52 minutes. Adequate norms are available as a result of an initial testing of several hundred pupils in different high schools."

One copy of Form A or Form B, 10c per copy. Teacher's Manual 25c. Specimen set 35c.

Survey Test in Plane Geometry. Forms A and B. John Clark and Vera Sanford. (Experimental Edition). Address: Vera Sanford, 425 West 123rd St., New York City. $2.00 per 100.

This test is designed as a final examination in plane geometry. Keys and median scores are furnished with the tests. The testing time is 45 minutes for each form.

Webb Geometry Test Form A. Paul E. Webb. Public School Publishing Co., Bloomington, Ill.

This test is in several parts: completing statements, multiple choice, and constructions, part of the work being numerical. The test is objective and simple to score.

Package of 25 tests and direction booklet, 75c. Sample set 15c.

GEOMETRY. (Add other materials in the space below.)

D. GENERAL DIAGNOSTIC TESTS

Rogers Tests for Diagnosing Mathematical Ability. Agnes L. Rogers, Bureau of Publications, Teachers College, Columbia University, New York City.

The object of this sextet of tests is to provide a quick means of diagnosing the mathematical ability of pupils in the third year of the junior high school (first year of the four-year high school). The tests also serve to discover particular lines of mathematical weakness. They are of such a nature as to enable a teacher to form an independent estimate of the pupil's mathematical capacity and the likelihood of success in future mathematical work. They measure original ability rather than the effects of training.

Booklet of tests 10c per copy. Teacher's Manual 50c. Specimen set 60c.

GENERAL DIAGNOSTIC TESTS. (Add other materials in the space below).

IV. MATERIALS PRIMARILY FOR TEACHERS

A. BIBLIOGRAPHIES

The following bibliographies are of service, particularly in tracing articles in the various periodicals. The current Yearbook of the National Council of Teachers of Mathematics should also be consulted.

The Teaching of Junior High School Mathematics. David Eugene Smith and W. D. Reeve. Ginn and Co., 70 Fifth Ave., New York City. $2.00.

Each chapter of this book contains an annotated bibliography which includes books and articles printed up to the early months of 1927.

Books That Help Make Mathematics Interesting. Truman P. Sharwell. The Mathematics Teacher, XIX: 419-428 (November 1926). Out of print. Consult library files.

Includes books and magazine articles for mathematics clubs and books for teachers. The books of both groups have helpful annotations.

A Brief List of Mathematical Books Suitable for Libraries in High Schools and Normal Schools. David Eugene Smith and Others. Bureau of Publications, Teachers College, Columbia University, New York City (1925). 15c.

This list is reprinted from the Teachers College Record, XXVI: 679-690 (April 1925). It also appears in The Mathematics Teacher, XVIII: 477-489 (November 1925).

High School Mathematics Clubs. Zulu Reed. The Mathematics Teacher, XVIII: 359-363 (October 1925). 40c.

A complete and valuable bibliography on the work of mathematics clubs.

A List of Reference Books and Magazines for Teachers of Mathematics. W. D. Reeve. The Mathematics Teacher, XV: 303-307 (May 1922). Single copy 40c.

This bibliography is classified according to the following six divisions:

Books of a general pedagogical nature. Books on the teaching of mathematics. Books relating to mathematical topics. Books containing recreational material. Books of a historical nature. Magazines.

Making Mathematics Interesting. Augusta Barnes. The Mathematics Teacher, XVII: 409-410 (November 1924). Single copy 40c.

Deals with mathematics clubs and contests.

Mathematics Books Published in Recent Years for Our Schools and for Our Teachers. Edwin W. Schreiber. First Yearbook of the National Council of Teachers of Mathematics (1926). Address: Charles M. Austin, The High School, Oak Park, Ill. $1.10.

This list is one of the most recent compilations. It will be found very helpful.

Mathematics Club Program. A. H. Wheeler. The Mathematics Teacher, XVI: 385-390 (November 1923). Out of print. Consult library files.

Several suggested programs, with a rather extensive bibliography dealing largely with the history of mathematics, and with puzzles, recreations, and number mysteries. This bibliography was prepared by a committee of the Association of Teachers of Mathematics of New England and the items listed are rated as excellent, good, and fair.

Union List of Mathematical Periodicals. David Eugene Smith. Superintendent of Documents, Washington, D. C. Bulletin 1918, No. 9. Free.

It should be noted that this bibliography does not include materials developed in the past ten years. For those consult the references above.

BIBLIOGRAPHIES. (Add other materials in the space below.)

B. HISTORY OF MATHEMATICS

Every high school library should contain at least one of the standard histories of mathematics, for reference use by the pupils. Encyclopedias also contain a great amount of material. Magazine articles, with a few noteworthy exceptions, are much less scholarly than are the histories but they often present a picture of a single topic in a way that makes it of special value to mathematics clubs.

General Histories

A History of Elementary Mathematics with Hints on Methods of Teaching. Florian Cajori. The Macmillan Co., 60 Fifth Ave., New York City. $2.25.

A valuable addition to a high school library.

A History of Mathematics (Second edition). Florian Cajori. The Macmillan Co., 60 Fifth Ave., New York City. $4.00.

Besides the material of the shorter text, this book contains an account of the history of higher mathematics not included in the "History of Elementary Mathematics."

History of Mathematics. David Eugene Smith. Ginn and Co., 70 Fifth Ave., New York City. Two volumes: Vol. I, $4.00; Vol. II, $4.40.

A history of mathematics that will remain the standard for years to come. Its illustrations are many and they are exceedingly useful. If a school can have but one history of mathematics in its library, it should have this one, if possible.

A Primer of the History of Mathematics. W. W. Rouse Ball. The Macmillan Co., 60 Fifth Ave., New York City. $1.00.

As the title indicates, this is a shorter and more elementary treatment of the subject than that given in the following reference, "A Short Account of the History of Mathematics."

A Short Account of the History of Mathematics. W. W. Rouse Ball. The Macmillan Co., 60 Fifth Ave., New York City. $4.00.

This is one of the best histories of mathematics. It is particularly fine in its treatment of Newton and his times.

Greece and Rome

Apollonius of Perga, the Treatise on Conic Sections. Edited in modern notation, introduction and earlier history of the subject by Sir Thomas Heath. Oxford University Press. 35 West 32nd St., New York City (1896). $5.00.

Excellent in its detail but far beyond the grasp of high school students.

Archimedes. Sir Thomas Heath. Pioneers of Progress Series. The Macmillan Co., 60 Fifth Ave., New York City (1920). 80c.

A popular account of the life and works of Archimedes prefaced by a discussion of Greek geometry before his day.

Archimedes. Geometrical Solutions Derived from Mechanics. Translated from the Greek by Dr. J. L. Heiberg; Introduction by David Eugene Smith; English version translated from the German by Lydia G. Robinson. Open Court Publishing Co., Chicago, Ill. 30c.

This essay gives the key to Archimedes' method of *discovering* theorems, and while it is somewhat complicated for most high school students, the better members of the older classes should be able to read it without difficulty.

Aristarchus of Samos, the Ancient Copernicus, a History of Greek Astronomy, with Aristarchus's Treatise on the sizes and distances of the Sun and Moon, a new Greek Text with translation and notes, by Sir Thomas Heath. With thirty-four figures in the text. Oxford University Press, 35 West 32nd St., New York City (1913). $6.00.

Like all of Sir Thomas Heath's work this is scholarly and authoritative, but for most students the "Copernicus of Antiquity" by the same author is the better choice.

The Copernicus of Antiquity. Sir Thomas Heath. Pioneers of Progress Series. The Macmillan Co., 60 Fifth Ave., New York City (1920). 80c.

An account of Greek astronomy, culminating with the work of Aristarchus, who adopted the heliocentric hypothesis in the third century B.C.

The Thirteen Books of Euclid's Elements. (See GEOMETRY, p. 34.)

A History of Greek Mathematics. Sir Thomas Heath. Two volumes. Vol. I, from Thales to Euclid; Vol. II, from Aristarchus to Diophantus. Oxford University Press, 35 West 32nd St., New York City (1921). $16.70.

A very valuable work for teachers to consult and to own.

Makers of Science: Mathematics, Physics, Astronomy, by Ivor B. Hart. With an Introduction by Charles Singer. Oxford University Press, 35 West 32nd St., New York City (1923). $2.00.

A popularly written history which deals with several phases of Greek science. Good for a high school library.

Mathematics. David Eugene Smith. Debt to Greece and Rome Series. Longmans, Green and Co., 55 Fifth Ave., New York City. $1.75.

The history of mathematics in Greece and Rome. Exceedingly readable and interesting.

Mathematics and Physical Science in Classical Antiquity. Translated from the German by J. L. Heiberg and D. C. MacGregor. Oxford University Press, 35 West 32nd St., New York City (1922). $1.00.

Contains a short, readable account of mathematics in Greece and Rome and some interesting notes on the history of medicine.

A Riddle from Archimedes. George W. Evans. The Mathematics Teacher, XX: 243-252 (March 1927). Single copy 40c.

A suggestion as to the method used by Archimedes in deriving his value for $\sqrt{3}$.

Some of Euclid's Algebra. George W. Evans. The Mathematics Teacher, XX: 126-141 (March 1927). Out of print. Consult library files.

A discussion that might well be made the basis of a mathematics club program.

Arithmetic

Fanciful Hypotheses on the Origin of the Numeral Forms. Florian Cajori. The Mathematics Teacher, XVIII: 129-133 (March 1925). Single copy 40c.

The title is self-explanatory and the article is a good antidote for the unscientific theories of the origin of numerals current with many people.

The First Book on Decimals. Vera Sanford. The Mathematics Teacher, XIV: 321-333 (October 1921). Single copy 40c.

An account of Stevin's treatise on decimals (1585), giving a note on the history of decimal fractions and excerpts from Stevin's work showing his notations, his scheme for locating the decimal point in multiplication and division, his application of decimals to practical problems, and his idea of a system of weights and measures based on decimals. These weights and measures foreshadowed the metric system although they differed from it in several important respects.

The Hindu-Arabic Numerals. David Eugene Smith and Louis Charles Karpinski. Ginn and Co., 70 Fifth Ave., New York City (1911). $1.60.

An account of the history of our numerals with many facsimiles to substantiate the statements made in the text.

The History of Arithmetic. Louis Charles Karpinski. Rand McNally and Co., 270 Madison Ave., New York City. $2.00.

An interestingly written account of the history of arithmetic, with many well chosen illustrations, and an excellent bibliography of arithmetics printed in this country prior to 1800.

Rara Arithmetica. David Eugene Smith. Ginn and Co., 70 Fifth Ave., New York City (1908). $5.00.

A catalogue of the arithmetics printed prior to 1600 that are now in the library of Mr. George A. Plimpton in New York City. It contains full notes and many facsimilies of pages from the books under discussion.

Number Stories of Long Ago. David Eugene Smith. Ginn and Co., 70 Fifth Ave., New York City. 60c.

An account of the way people have written numbers and how they have used them. Written for children, but grown people will enjoy it too. The final chapter gives a number of recreations and puzzles that are not generally accessible elsewhere. The illustrations are excellent and the style of the work is delightful.

Recent Symbolism for Decimal Fractions. Florian Cajori. The Mathematics Teacher, XVI: 183-187 (March 1923). Out of print. Consult library files.

Gives an answer to the question of the differences in the meaning of a period and a dot above the line in English and American notations. It also gives the history of the other symbols used in writing decimal fractions.

Algebra, Notation, Special Topics

A Dutch Textbook of 1730. Lao G. Simons. The Mathematics Teacher, XVI: 340-347 (October 1923). Out of print. Consult library files.

Describes an algebra printed in New York City in 1730. Includes several facsimiles of pages of this book and gives translations of a number of its problems.

The Evolution of Our Exponential Notation. Florian Cajori. School Science and Mathematics, XXIII: 573-581 (June 1923). Single copy 35c.

An excellent article, showing the development of the symbolism for exponents. It also illustrates the steps in the adoption of Descartes' exponents and in their extension to include values that are negative, fractional, and complex.

The History of Mathematics in Europe from the Fall of Greek Science to the Rise of the Conception of Mathematical Rigour. J. W. N. Sullivan. Oxford University Press, 35 West 32nd St., New York City (1925). $1.00.

Contains exceedingly interesting material—a valuable asset to a school library.

History and Significance of Certain Standard Problems in Algebra. Vera Sanford. Bureau of Publications, Teachers College, Columbia University, New York City. $1.50.

This book gives the history of certain problems prominent in elementary algebras and arithmetics, showing the variants of these problems at different periods and suggesting the factors that led to their inclusion in texts on mathematics.

Introduction of Algebra into American Schools in the 18th Century. Lao G. Simons. Bulletin No. 18, 1924. Superintendent of Documents, Washington, D. C. 15c.

This bulletin contains facsimile pages of great interest. The text shows the contrast between the work offered in algebra in the eighteenth century and that given to-day. It might be used in a club program on "College Requirements in Mathematics."

Japanese Problems. Shige Hiyama. The Mathematics Teacher, XVI: 359-365 (October 1923). Out of print. Consult library files.

The subject matter of this paper is a group of problems found in a hitherto unpublished Japanese manuscript in the library of

Professor David Eugene Smith. The problems are concerned with numerical calculations dealing with geometry.

The Oldest Algorism in the French Language. Anna Elizabeth Houghtaling and Frances Marguerite Clarke. The Mathematics Teacher, XIX: 179-183 (March 1920). Out of print. Consult library files.

Gives the translation of a mathematical manuscript written in French in the thirteenth century. Describes the use of Hindu-Arabic numerals and tells how to divide, using these numerals. The author also attempts to find a cube root. The manuscript is the oldest algorism (work dealing with Hindu-Arabic numerals) in the French language.

The Origin and Development of Algebra. Louis Charles Karpinski. School Science and Mathematics, XXIII: 54-64 (January 1923). Single copy 35c.

This article gives particular attention to the theoretical work of the Egyptians, but carries the work to the nineteenth century.

The Origin and Development of Our Present Method of Extracting the Square and Cube Roots of Numbers. Martin A. Nordgaard. The Mathematics Teacher, XVII: 223-237 (April 1924). Out of print. Consult library files.

Summarizes the development of our methods of getting the square and cube roots of numbers and indicates other methods once in use. Full examples are given of each method and the article concludes with a bibliography.

Permutations of the 16th Century Cabala. Morris Turetsky. The Mathematics Teacher, XVI: 29-34 (January 1923). Single copy 40c.

Includes a translation of the work on permutations given by Rabbi Moses Cordovero in a work printed in 1552. The translation is interesting and the notes are good.

Rabbi ben Ezra on Permutations and Combinations. Jekuthiel Ginsburg. The Mathematics Teacher, XV: 347-356 (October 1922). Single copy 40c.

It appears that Rabbi ben Ezra saw no use for the study of permutations outside of astrology, and the work on which this article is based shows how the theory of permutations was applied to the number of the conjunctions of the various planets.

Robert of Chester's Latin Translation of the Algebra of Al-Khowarizmi. Louis Charles Karpinski. The Macmillan Co., 60 Fifth Ave., New York City (1915). $2.00.

Particularly valuable for the solutions of quadratic equations. Interesting material for mathematics club programs.

Robert Recorde. Florian Cajori. The Mathematics Teacher, XV: 294-302 (May 1922). Single copy 40c.

Robert Recorde was the first writer of note to publish books in the English language on arithmetic, algebra, and geometry. In this article, Professor Cajori gives considerable space to quotations that illustrate Recorde's style and to the terms which Recorde used.

Some Variations of Minus Signs. Florian Cajori. The Mathematics Teacher, XVI: 295-301 (May 1923). Single copy 40c.

This article traces the use of the symbol $\div$ as a *minus* sign through upwards of four hundred years. Other variants of the sign are mentioned.

The Unification of Mathematical Notations in the Light of History. Florian Cajori. The Mathematics Teacher, XVII: 87-93 (February 1924). Out of print. Consult library files.

An extremely valuable and interesting summary of an important topic.

The Works of William Oughtred. Florian Cajori. Open Court Publishing Co., Chicago, Ill. (1916). $1.00.

An account of the life and work of the English scholar who invented the slide rule.

Analytics, Non-Euclidean Geometry, and Calculus

Des Cartes la Geometrie. French-English Edition. Translation by Marcia Latham and Professor David Eugene Smith, with an introduction by the latter. Open Court Publishing Co., Chicago, Ill. $4.00.

A valuable addition to a mathematics library. Contains reproductions from the original French Edition published in 1637. A book particularly useful to classes in advanced algebra as it contains Descartes' Rule of Signs.

The Early Mathematical Manuscripts of Leibniz. Published by Carl Immanuel Gerhart. Translated from the Latin

texts with critical and historical notes by J. M. Childs. Open Court Publishing Co., Chicago, Ill. $1.50.

"The manuscripts of Leibniz, which have been preserved with such great care in the Royal Library at Hanover, show perhaps more clearly than his published work the great importance which Leibniz attached to suitable notations in mathematics and, it may be added, in logic generally."

Essays on the Life and Work of Newton. Augustus DeMorgan. Edited with notes and appendices by Philip E. B. Jourdain. Open Court Publishing Co., Chicago, Ill. $2.00.

This volume of essays gives interesting points on Newton's life and work and is especially valuable for the light which it throws on the Newton-Leibniz controversy.

The Geometrical Lectures of Isaac Barrow. Translated from a first edition copy by J. M. Child. Open Court Publishing Co., Chicago, Ill. $1.00.

These are lectures given by Newton's teacher who later resigned his professorship, nominating Newton as his successor. The translator claims to have discovered in these lectures, concealed under the geometrical form of theorems and constructions for drawing tangents and finding areas, an absolutely complete elementary treatise on the infinitesimal calculus.

A Great Mathematician as a School Boy. David Eugene Smith and Vera Sanford. The Mathematics Teacher, XIV: 362-366 (November 1921). Out of print. Consult library files.

This gives a facsimile of a letter written by Legendre at the age of eighteen, five years before he became professor of mathematics in the Ecole Militaire in Paris. The letter tells of astronomical observations made by Legendre.

A History of the Conceptions of Limits and Fluxions in Great Britain from Newton to Woodhouse. Florian Cajori. Open Court Publishing Co., Chicago, Ill. $2.00.

Interesting to a class in the calculus.

A History of Japanese Mathematics. David Eugene Smith and Yoshio Mikami. Open Court Publishing Co., Chicago, Ill. $2.00.

"This book shows the nature of the mathematics indigenous to Japan and will serve to strengthen the bonds that unite the scholars of the world." Important as the best source of information on

Japanese mathematics. Among the illustrations are examples of several types of magic circles.

Isaac Newton, 1642-1727. A Memorial Volume edited by W. J. Greenstreet. G. Bell and Sons, Ltd., London.

A volume of Newton essays by various authors; contains among other items a transcription of a notebook kept by Newton when a boy and facsimile pages of this work.

Sir Isaac Newton. S. Brodetsky. Van Nostrand Co., 8 Warren St., New York City. $2.00.

The most recent and one of the best biographies of Sir Isaac Newton obtainable.

Sir Isaac Newton, 1727-1927. A Bi-centenary Evaluation of His Work. Edited by F. E. Brasch. Williams and Wilkins Co., Baltimore, Md. (1928). $5.00.

This volume contains the papers presented at the meeting of the History of Science Society, the American Mathematical Society, and other organizations in November, 1927. Among the authors are David Eugene Smith, G. D. Birkhoff, Florian Cajori, and Michael I. Pupin. The various sections evaluate Newton's contributions in the light of modern criticism.

Saccheri's Euclides Vindicatus. George Bruce Halsted. Latin-English edition of the first non-Euclidean geometry published in Milan, 1733. Open Court Publishing Co., Chicago, Ill. $2.00.

"A geometric endeavor in which are established the foundation principles of universal geometry, with special reference to Euclid's Parallel Postulate." Interesting to a mathematics club studying non-Euclidean geometry.

Some Lovers of Conic Sections. Margaret L. Chapin. The Mathematics Teacher, XIX: 36-46 (January 1926). Single copy 40c.

An excellent short account of the history of analytic geometry.

See section on PICTURES, p. 122, for illustrative material on the history of mathematics and for portraits of mathematicians.

HISTORY OF MATHEMATICS. (Add other materials in the space below.)

C. PERIODICALS AND YEARBOOKS

The simplest way to keep in touch with the rapidly growing literature in the field of high school mathematics is through articles and reviews in periodicals and through the Yearbooks of the National Council of Teachers of Mathematics.

Periodicals

The American Mathematical Monthly. Address: Professor W. D. Cairns, Oberlin, Ohio. Subscription to members of the Mathematical Association of America, $4.00; to others, $5.00.

Although this magazine is devoted primarily to the interests of collegiate mathematics, it frequently publishes articles of great value in the history of mathematics as well as reviews of books that are of special interest to teachers in the secondary schools.

Isis. Address: F. E. Brasch, Smithsonian Division, Library of Congress, Washington, D. C. Subscription to members of the History of Science Society, $5.00; to others, $6.00.

The articles in this quarterly are not so close to the needs of secondary teachers as are those of the *Mathematics Teacher* and *School Science and Mathematics.* On the other hand, its annotated bibliographies and articles on the history of mathematics should be consulted from time to time.

The Mathematics Teacher. 525 West 120th St., New York City. $2.00.

This is the official organ of the National Council of Teachers of Mathematics, and a subscription to this journal carries with it membership in the Council. Its eight issues each year are devoted to mathematics in the elementary and secondary schools, and the frequent references to its articles in this bulletin are an index of their usefulness in enriching the teaching of mathematics.

School Science and Mathematics, 2055 East 72nd Pl., Chicago, Ill. $2.50.

This is the journal of the Central Association of Science and Mathematics Teachers. The "Problem" department is especially fine.

Yearbooks of the National Council of Teachers of Mathematics

First Yearbook (1926): A GENERAL SURVEY OF PROGRESS IN THE LAST TWENTY-FIVE YEARS. Address: Charles M. Austin, The High School, Oak Park, Ill. $1.10 (Paper only).

Contents:

"A General Survey of the Progress of Mathematics in Our High Schools in the Last Twenty-Five Years," David Eugene Smith.
"On the Foundations of Mathematics," Eliakim Hastings Moore.
"Suggestions for the Solution of an Important Problem That has Arisen in the Last Quarter of a Century," Raleigh Schorling.
"Improvement of Tests in Mathematics," William David Reeve.
"The Development of Mathematics in the Junior High School," William Betz.
"Some Recent Investigations in Arithmetic," Frank Clapp.
"Mathematics and the Public," Herbert E. Slaught.
"Recreational Values Achieved Through Mathematics Clubs in Secondary Schools," Marie Gugle and Others.
"Mathematics Book Published in Recent Years for Our Schools and Our Teachers," Edwin W. Schreiber.

Second Yearbook (1927): CURRICULUM PROBLEMS IN TEACHING MATHEMATICS. Address: Bureau of Publications, Teachers College, Columbia University, New York City. $1.25 (paper) or $1.50 (cloth).

Contents:

PART I: ARITHMETIC:

"Some Aspects of Elementary Arithmetic," F. B. Knight.
"Curriculum Problems in Arithmetic," G. T. Buswell.
"Some Problems of a Supervisor of Arithmetic in the Elementary Schools," Jessie P. Haynes.

PART II: JUNIOR HIGH SCHOOL MATHEMATICS:

"Reorganized Mathematics in the Junior High School," Harry C. Barber.
"Problems in the Field of Junior High School Mathematics," C. L. Thiele.
"Effect of Varying the Amount of Arithmetic, Geometry and Algebra Studied in the Field of Junior High School Mathematics," Ralph Beatley.
"Objectives in the Teaching of Junior High School Mathematics," David Eugene Smith and William David Reeve.

PART III: SENIOR HIGH SCHOOL MATHEMATICS:

"Mathematics in the Senior High School," David Eugene Smith.

"The Mathematics Curriculum in the Senior High School," Eugene R. Smith.
"A Reorganized Course of Study for Senior High School Mathematics," Gertrude E. Allen.
BIBLIOGRAPHY.

Third Yearbook (1928): SELECTED TOPICS IN TEACHING MATHEMATICS. Address: Bureau of Publications, Teachers College, Columbia University, New York City. $1.75 (cloth).

"The Fallacy of Treating School Subjects as 'Tool Subjects'," Charles H. Judd.
"Mathematics in the Training for Citizenship," David Eugene Smith.
"Mathematics as an Interpreter of Life," W. S. Schlauch.
"The Reality of Mathematical Processes," E. R. Hedrick.
"Developing Functional Thinking in Secondary School Mathematics," E. R. Breslich.
"Dynamic Symmetry," Marie Gugle.
"Introductory Calculus as a High School Subject," M. A. Nordgaard.
"Selected Topics in Calculus for the High School," John A. Swenson.
"Teaching Thrift Through the School Savings Bank," Clifford B. Upton.
"The Teaching of Direct Measurement in the Junior High School," William Betz.
"Measurement and Computation," George W. Finley.
"Problem Solving in Arithmetic," Lucile I. Dower.
"The Use of Measuring Instruments in Teaching Mathematics," C. N. Shuster.
"A Mathematical Atmosphere," Olive A. Kee.

The Reorganization of Mathematics in Secondary Education. Edited by J. W. Young. Houghton Mifflin Co., 4 Park St., Boston, Mass. $1.20.

This is a reprint of the first part of the "Report of the National Committee on Mathematical Requirements," first published in 1923 and now out of print. It contains chapters on "The Function Concept in Secondary School Mathematics" and "Terms and Symbols in Elementary Mathematics." The Appendix has extracts from Vevia Blair's original report on "The Present Status of Disciplinary Values in Education" and R. C. Archibald's "Training of Teachers of Mathematics." It also includes articles by C. B. Upton on "The Testing Movement in Mathematics" and by Vevia Blair on "High School Courses in the Calculus."

PERIODICALS AND YEARBOOKS. (Add other materials in the space below.)

D. APPRECIATION OF MATHEMATICS

The following bibliography is concerned with books and short essays whose value to the teacher is incalculable for their view of the philosophy and poetry of the subject. Many of these articles are of interest to the more thoughtful and mature student. In general their content can not be carried bodily into the classroom, but it serves to enrich the course to the degree to which it influences the teacher.

Special Topics

Essays on Mathematical Education. G. St. L. Carson. Ginn and Co., 70 Fifth Ave., New York City (1913). $1.20.

A scholarly work containing essays on Intuition, The Useful and the Real, Unrealized Possibilities of Mathematical Education, as well as others on the teaching of arithmetic and geometry. These are very suggestive, and when read with the date of publication in mind they make one realize how much preliminary work had to be accomplished before changes in mathematics courses could be realized. The fact that Carson is an Englishman adds to the interest of these essays.

The Extension of Concepts in Mathematics. Aubrey J. Kempner. The Mathematics Teacher, XVI: 1-21 (January 1923). Single copy 40c.

This article discusses the introduction into mathematics of irrational numbers, imaginaries, infinity, non-Euclidean geometry, and four-dimensional geometry, showing how each was necessary if existing mathematical laws were to be preserved.

Mathematical Essays and Recreations. H. Schubert. Open Court Publishing Co., Chicago, Ill. 75c.

A collection of essays, including Magic Squares, Fourth Dimension, Circle Squarers. The treatment of the Fourth Dimension as given here is especially good. The title is a bit misleading for the work is a collection of authoritative essays rather than a collection of puzzle problems.

Mathematics and Music. Raymond C. Archibald. American Mathematical Monthly, XXXI: 1-25 (January 1924). Single copy 60c.

A delightful article by a man well fitted to write on both mathematics and music. It contains many surprises for folk who suppose that the two subjects are totally unrelated.

Monographs on Modern Mathematics Relevant to the Elementary Field. J. W. A. Young. Longmans, Green and Co., 55 Fifth Ave., New York City. $4.00.

Discusses the theory of parallels, fundamental concepts of geometry, the transcendence of π, and the nature of the algebraic equation.

Number Concepts. A. Conant. The Macmillan Co., 60 Fifth Ave., New York City. $4.00.

A work on early methods of counting.

Essays. The following essays by David Eugene Smith of Teachers College, Columbia University, need no annotation for his many students. Parts of them formed the nucleus of certain memorable lectures in Professor Smith's Practicum in the Teaching of Mathematics. Others were written for other occasions. To these essays should be added Professor Smith's address at a dinner given in his honor at the close of his twenty-five years of teaching at Teachers College, Columbia University. This appears in The Mathematics Teacher, XIX: 276-281 (May 1926).

1. The Call of Mathematics. The Mathematics Teacher, XIX: 282-290 (May 1926).
2. Esthetics and Mathematics. The Mathematics Teacher, XX: 419-429 (December 1927).
3. The Form of the Universe. The Mathematics Teacher, XXI: 107-111 (February 1928).
4. Introduction to the Infinite. The Mathematics Teacher, XXI: 1-10 (January 1928).
5. Mathematics in the Training for Citizenship. Teachers College Record, XVIII: 211-225 (March 1917). Out of print. Reprinted in the Third Yearbook of the National Council of Teachers of Mathematics. Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.
6. The Poetry of Mathematics. The Mathematics Teacher, XIX: 291-296 (May 1926).
7. Religio Mathematici. Teachers College Record, XXII, 380-393 (November 1921). Out of print. Also in The Mathematics Teacher, XIV.: 413-426 (December 1921).

Philosophy of Mathematics

Fate and Freedom. Alfred Korzybski. The Mathematics Teacher, XVI: 274-290 (May 1923). Single copy 40c.

This article analyzes the fundamental principles underlying the "Science and Art of Human Engineering." What is "the directing of the energies and capacities of human beings to the advancement of human weal?" The author asserts that this science must be mathematical in spirit and he devotes the major part of his article to the development of that theme. The paper merits careful and thoughtful reading—but for an adult, not for an immature mind.

The Human Worth of Rigorous Thinking. C. J. Keyser. Columbia University Press, New York City. $3.50.

Appraises the value of mathematics in the life of the individual.

Introduction to Mathematics. Alfred North Whitehead. Henry Holt and Co., 1 Park Ave., New York City. $1.00.

A clear and readable presentation of the basic principles of philosophy of mathematics.

Mathematical Philosophy. C. J. Keyser. E. P. Dutton and Co., 681 Fifth Ave., New York City. $4.70.

A book to be studied thoughtfully, not to be read lightly; gives the reader a new conception of mathematics.

Thinking About Thinking. C. J. Keyser. E. P. Dutton and Co., 681 Fifth Ave., New York City. $1.00.

An essay that purports to be a study of "postulational" thinking, but really is a strong argument for the teaching of demonstrative geometry.

APPRECIATION. (Add other materials in the space below.)

V. EQUIPMENT FOR THE MATHEMATICS CLASSROOM

A. GENERAL AND INDIVIDUAL EQUIPMENT

Equipment for a mathematics classroom comes under two heads: general equipment and individual equipment. Under the first heading would belong a graph blackboard, blackboard compasses and protractors, surveying instruments of different types, pantographs, meter sticks, cabinets of weights and measures, and the like. Individual equipment includes such materials as graph paper, compasses, triangles, protractors, drawing boards, T-squares, rulers.

It is imposible to quote prices for these articles, but the following dealers are suggested and the type of supplies handled by them is noted. Send for free catalogues for prices and descriptions. Many of these firms give school discounts.

Dealers

Central Scientific Co., 460 E. Ohio St., Chicago, Ill.

Surveying instruments, slated globes, drawing instruments.

Dennison Manufacturing Co., Fifth Ave. and 26th St., New York City.

Black lantern slide bindings (15c a roll), invaluable for making bar diagrams rapidly. Also red, green and gold gummed paper ribbon (10c a roll), useful where several colors are needed for a graph. These supplies may be obtained at most stationers. This company also makes gummed stars of various sizes and colors which are useful in keeping class charts of test records, etc.

Eugene Dietzgen Co., 218 East 23rd St., New York City.

Individual and blackboard equipment, pantographs, surveying instruments, graph paper of all sorts.

Favor, Ruhl and Co., 43 West 23rd St., New York City.

Individual and blackboard drawing equipment.

J. L. Hammett Co., 380 Jelliff Ave., Newark, N. J.

Industrial drawing kit consisting of drawing board, T-square, and triangles, individual and blackboard drawing equipment, pantographs, cabinet of weights and measures, graph chart on blackboard cloth, slated globes, and wooden models of solids.

Harter School Supply Co., 2046 East 71st St., Cleveland, Ohio.

Pantographs in large and small sizes.

Keuffel and Esser Co., 127 Fulton St., New York City.

Individual and blackboard drawing equipment, surveying instruments of all types, pantographs, graph paper, etc. The Junior High School Drawing Kit, consisting of ruler, compasses, protractor and graph paper, should be noted especially.

Montgomery Ward and Co., Chicago, Ill.

Farmers' surveying sets, including level, tape, and rod.

L. S. Starrett Company, Athol, Mass.

Steel tapes, transits, surveying rod.

NOTE: Where blackboard space can be spared, the squares of a graph blackboard may be painted on the permanent fixture, using light gray or light green paint. The lines may be as close as ½ inch and it is helpful to have every tenth line somewhat heavier than the intermediate ones. In this case, care should be taken that the extra width is taken equally from the spaces at each side of the heavy line.

Equipment for Special Subjects

GEOMETRY

Besides the regular classroom equipment of compasses, meter sticks, and protractors, the geometry classroom may well be provided with parallel rulers and a pantograph.

"Erector" sets are of valuable assistance in work in intuitive geometry and in discovering theorems in demonstrative geometry. Small sets sufficient for this purpose may be purchased at the Ten Cent Stores for 10c. The maker is A. C. Gilbert, New Haven, Conn.

The catalogues of the supply companies may be utilized to advantage in showing the applications of geometry to be found in proportional compasses, the hypsometer, clinometer, and other instruments. Models for solid geometry may be obtained from the supply companies or they may be made of plasticene or by cutting them from cakes of Ivory soap. "Dead" tennis balls are useful in the study of spherical geometry.

Trigonometry

Plain Scale Trinometer. The Rowe Instrument Co., Williamsburg, Va., $25.00, plus postage.

This instrument solves all plane triangles, giving all the unknown parts at once, finding their areas as the product of base and half-altitude. It may be used to find the sine, cosine, tangent, cotangent, secant, or cosecant of an acute angle and it gives a check on trigonometric computations.

The Calculus

The catalogues of Keuffel and Esser Company and Eugene Dietzgen Company give illustrations of planimeters and integraphs. These are useful in any work in which the theory of the instruments is discussed.

EQUIPMENT. (Add other materials in the space below.)

B. BULLETIN BOARDS AND EXHIBITS

A bulletin board is a valuable asset to a mathematics classroom. It permits the display of charts showing the standing of classes or individuals, and illustrative material of interest to special classes or to a whole group. It offers a clearing house for the exchange of puzzle problems and it may become the means of stimulating interest by a series of challenges when particularly difficult problems are proposed for solution by any student regardless of his class. Clippings of current interest may be posted. The uses of the bulletin board are numerous, but perhaps its greatest value is in showing to the students of a class that mathematics has wide ramifications and that they are studying only a small portion of the field. Experience has shown that the use of illustrative material on the bulletin board for one class has resulted in increased interest for all classes using that particular room. Exhibits should be changed frequently.

Perhaps there is no more effective way to conclude a unit of work than by the preparation of an exhibit of material that illustrates a project. There is danger, however, that the preparation of the material will become the sole object of the unit of work. But there is much to commend the preparation of an exhibit as a unit of work proceeds. So far as is practical, this should be pupil-initiated and pupil-planned.

Equipment

Bulletin boards may be made of burlap stretched in a frame, or of cork, linoleum, or compo-board. These bulletin boards may be obtained from supply companies (p. 115).

Multiplex Display Fixture Co., 918 North Tenth St., St. Louis, Mo.

This company deals in many types of equipment, including a cabinet for the care of lantern slides and bulletin boards of various types.

Exhibits

The value of exhibits and of bulletin boards is discussed in:

Exhibit of High School Mathematics—Its History and Educational Value. W. D. Reeve. School and Society, 2: 191-197 (August 7, 1915).

A Mathematical Atmosphere. Olive A. Kee. Third Yearbook of the National Council of Teachers of Mathematics (1928). Address: Bureau of Publications, Teachers College, Columbia University, New York City. $1.75.

See also BANKING AND INVESTMENTS, p. 1
GRAPHS, p. 26
HISTORY OF MATHEMATICS, p. 97
MATHEMATICS CLUBS, p. 51
PICTURES, p. 122
RECREATIONS AND PUZZLES, p. 43
THRIFT, SAVINGS, INVESTMENTS, p. 9

BULLETIN BOARDS AND EXHIBITS. (Add other materials in the space below.)

C. CARE OF ILLUSTRATIVE MATERIAL

Some sort of filing system is essential if the large quantity of illustrative material that may be gathered from current magazines and newspapers, from pictures, from advertising circulars, and the like, is to be readily available for bulletin boards or for class use.

Equipment for Filing. The following firms should be consulted in regard to filing equipment:

Baker Vawter Co., Benton Harbor, Mich.
The Globe Wernicke Co., Cincinnati, Ohio.
Multiplex Display Fixture Co., 918 North Tenth St., St. Louis, Mo.
Remington Rand Business Service, Towanda, N. Y.
William F. Wholey Co., Inc., Equipment Specialists, 11 East 36th St., New York City.
Yawman and Erbe Manufacturing Co., 368 Broadway, New York City.

Mending and Repair of Books. M. W. Brown. American Library Association, 86 East Randolph St., Chicago, Ill. 25c.

Simple directions for book repairing. Gives list of mending supplies.

Suggestions for the Care and Use of Pamphlets and Clippings in Libraries. O. P. Dickey. H. W. Wilson Co., 958 University Ave., New York City. Out of print. Consult library files.

Complete directions for the care of unbound material. Good bibliography.

Supplies. The following firms deal in supplies for the care of pamphlets, pictures, post cards, lantern slides, and the like. Send for their catalogues.

Democrat Printing Co., Madison, Wis.
Gaylord Brothers, Syracuse, N. Y.
Library Bureau, 380 Broadway, New York City.

University Prints Note Book for Mounting Pictures. University Prints Co., Newton, Mass. $1.25.

A notebook for mounting prints. Space for 200 pictures is provided. Green-gray sheets with paper for notes.

Vertical File in Every Library. Ontz and Miller. Library Bureau, 380 Broadway, New York City. Free.

Directions for filing and cataloguing clippings, pictures and pamphlets.

CARE OF ILLUSTRATIVE MATERIAL. (Add other materials in the space below.)

D. PICTURES

Certain of the pictures and postcards listed here are suitable for framing for use in mathematics classrooms. When this is done, it is suggested that the pictures be changed from room to room at frequent intervals. When pictures are to be circulated in a class or used on a bulletin board, it is advisable to enclose each in a celluloid holder, such as those made by Gaylord Bros., Syracuse, N. Y. Merely placing pictures in a classroom is not enough. Their subjects should be so chosen that occasional reference may be made to them. It is generally necessary for the teacher to interpret the pictures to the students.

Geometric Design

American Museum of Natural History, Columbus Ave., and 77th St., New York City. Address: Mr. George H. Sherwood, Curator of Public Education. Descriptive leaflets free.

Information may be obtained from the Museum regarding their collection of pictures illustrating geometric designs in nature and in primitive handicrafts. The prices of these pictures range from 6c for a 3¼ x 4¼ in. unmounted photograph to $2.40 for a 14 x 17 in. sepia enlargement. Pictures on astronomical subjects may also be obtained.

History of Mathematics

British Museum. Publication Department, London, W. C. 1, England.

1. Facsimile of pages from old manuscripts as follows:
   a. Landscape with clerks studying astronomy and geometry and using various old-time instruments. Royal Ms. 20Bxxf3. 4 shillings.
   b. Mathematical lesson. Burney Ms. 275f336. 1 shilling 3 pence.
   c. Animals using mathematical instruments. Burney Ms. 275f. 390v. 4 shillings.
   d. Zoroaster with musical instruments, compasses and astrolabe. Cotton Ms. Augustus Av. f25v. 6 shillings.
2. Greek and Roman Life, including one card showing mathematical instruments of Roman date. This card is not sold separately. Postcard set XXIX: 1 shilling.
3. Clocks from the 16th to the 18th centuries in the Museum. Fifteen cards and an explanatory leaflet. 1 shilling.

Bureau of Publications, Teachers College, Columbia University, New York City. Mural Paintings Illustrating the History of Mathematics, by Henri Caro-Delvaille. 90c a set.

This set consists of colored reproductions of three mural paintings now in the Lincoln School of Teachers College. The introductory and explanatory notes written by David Eugene Smith add to the interest and value of the pictures.

Metropolitan Museum of Art, Fifth Ave. and Central Park East, New York City.

The Museum will make copies of prints and facsimiles of pages of the books in its collections.

Oxford University Press, 35 West 32nd St., New York City. Oxford Science Series, 6 cards, 28c.

Albrecht Dürer's alphabet showing use of geometry in designing, lettering and facsimiles of pages from the textbooks of Robert Recorde. These give an early instance of the use of the multiplication sign and the first examples of the use of the sign of equality.

United States National Museum (Smithsonian Institution), Washington, D. C. All correspondence should be addressed to the Secretary.

1. The compass of George Washington. Negative No. 26482. 50c.
2. The transit used by Andrew Ellicott in surveying the Spanish possessions in the United States, the laying out of the boundaries of the District of Columbia, and a portion of the boundary between New York and Canada. Negative No. 19792.
3. A Volpel astronomical globe made in Cologne, Germany, about 1541. Negative No. 14010. 50c.
4. The Burt solar compass which was adopted by the United States Geological Survey and used in the first surveying work. $2.00 per print.
5. Old Persian astrolabes. $2.00 per print.

University Prints Co., Newton, Mass. No. 405 "Melancholy," Albrecht Durer. 5½x8 in., 1¼c each.

By "Melancholy," Dürer meant reflective thinking. The presence of a magic square of sixteen cells in this picture shows the interest that was paid to this topic in the sixteenth century.

Portraits of Mathematicians

Brown's Famous Pictures. George P. Brown and Co., 38 Lovett St., Beverley, Mass. Catalogue 5c.

Sir Isaac Newton, No. 1268.
Leonardo da Vinci, No. 609.
Miniature pictures: 3 x 3¼ in., 1c each.
Extra size: 5½ x 8 in., 2c each; 9 x 12 in., 4c each.
Pictures in packets: 20 for 30c.

The Open Court Publishing Co., Chicago, Ill.

The following portraits are suitable for framing and they add greatly to the interest of a classroom in mathematics.

Barrow.	L'Hopital.
Bernoulli, Jacob.	Monge.
Bernoulli, Johann.	Pascal (vellum only).
Cavalieri.	Tartaglia.

Size: 11 x 14 in. American plate or Japanese vellum. 35c each. 20% discount to teachers.

Oxford University Press, 35 West 32nd St., New York City. Old Ashmolean Postcards, Oxford Science Series. 6 cards, 28c a set.

1. *Men of Science of the 17th Century.* This set includes pictures of certain men prominent in the founding of the Royal Society. The only one of importance in mathematics is Christopher Wren.
2. *Great Inventors.* Includes Richard of Wallingford, the first Englishman to write a description of the making of scientific instruments, and also Robert Recorde, who invented the sign of equality.

Perry Pictures Co., Malden, Mass. Illustrated catalogue, 15c.

Chaucer, No. 70.
Leonardo da Vinci, Portrait of Himself, No. 277.
Sir Isaac Newton, No. 104.
School of Athens (Raphael), No. 330B.
The Astronomer Kratzer (Holbein), No. 787.
Prints: 3 x 3½ in., 1c each for 50 or more.
5½ x 8 in., 2c each for 25 or more.
7 x 9 in., 4c each for 15 or more.
10 x 12 in., 10c each for 5 or more.
Artotypes: 22 x 28 in., $1.00 each for 2 or more.

Thompson Publishing Co., Syracuse, N. Y. Illustrated catalogue, 25c.

Sir Isaac Newton—Art Reproductions, No. 386c.
Blue print 4 x 5 in., 2c.
Black and white print, 4 x 5 in., 15c; 8 x 10 in., 50c.
Lantern slides, 50c each.

University Prints Co., Newton, Mass. Illustrated catalogue, 5c.

1. Galileo—Portrait by Sustermans, No. 153.
2. Mathematician—Ferdinand Bol., No. 287.
3. School of Athens—Raphael, No. 167.
4. Mathematicians—Detail of No. 167, No. 168.

Standard Edition, 1½c each. Miniature Edition, ¾c each.

United States National Museum (Smithsonian Institute), Washington, D. C. All correspondence should be addressed to the Secretary.

The Museum has a large assortment of pictures of great mathematicians, such as:

1. Newton, Sir Isaac; Bessel F. W., Maxwell, James C. 50c each.
2. Leibnitz, Gottfried; Cantor, Moritz; Euler, Leonhard; Fourier, J.; Lagrange, Joseph; de Laplace, Pierre Simon; Gauss, C. T.; Abel, P. A.; Cauchy, Augustin; Euclid. $2.00 each.

Posters

Educational Poster Service. National Child Welfare Association, 70 Fifth Ave., New York City. Descriptive, illustrated price list free.

This association specializes in originating and selling at cost educational posters dealing with the physical, mental and moral development of children from birth to maturity. Posters on thrift and budgeting of special interest to teachers of mathematics. Size, 17 x 28 in. Will make posters planned and executed by children.

PICTURES. (Add other materials in the space below.)

VI. MISCELLANEOUS ITEMS

Bibliography on the Use of Visual Aids in Education. J. J. Weber. Educational Screen, Inc., 5 South Wabash Ave., Chicago, Ill. 25c.

Suggests many interesting articles and helps on the use of visual aids.

Burrelle's Press Clipping Bureau. 145 Lafayette St., New York City.

Will supply newspaper clippings on all subjects. These are taken from the leading newspapers and journals of the East. $5.00, 100 clippings, if taken within one year; 250 clippings, $12.00, good until all are secured.

Pacific Press Clipping Bureau, An All-Western Service of the Pacific Northwest, 408 Marion St., Seattle, Wash.

Will supply clippings on all subjects. Taken from the leading newspapers and journals of the West. Minimum charge, $3.00 per month. 5c a clipping.

State Material. Free. Every teacher should get in touch with the excellent free material distributed by the various state educational organizations. Send for catalogue and bulletins issued by the departments listed below:

The State Department of Education.
The State Library Association.
The State University—Library; Department of Visual Education; Extension Bureau; School of Education.
Agricultural Experiment Stations.
State Museums.
State Department of Vital Statistics, etc.

MISCELLANEOUS ITEMS. (Add other materials in the space below.)

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